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Master in Management Program

DETERMINANTS OF THE INNOVATION SOURCING MODE: COMPARISON OF RUSSIA AND CHILE

Master's Thesis by the 2nd year student

Concentration — Master in Management

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ЗАЯВЛЕНИЕ О САМОСТОЯТЕЛЬНОМ ХАРАКТЕРЕ ВЫПОЛНЕНИЯ ВЫПУСКНОЙ КВАЛИФИКАЦИОННОЙ РАБОТЫ

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АННОТАЦИЯ

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Описание цели, задач и основных результатов	Цель данного исследования состоит в определении детерминант выбора инновационных стратегий Российских и Чилийских малых и средних предприятий. Я выделила факторы экосистемы инноваций, влияющие на решение компаний заниматься инновационной деятельностью, и протестировала ее на двух кросс-секциях компаний России и Чили с использованием логистического регрессионного анализа. Результаты продемонстрировали разницу во влиянии разных факторов экосистем инноваций в двух странах на решения компаний об инновациях.
Ключевые слова	Инновации, экосистема инноваций, источники инноваций, внешние детерминанты инновационности

ABSTRACT

Master Student's Name	Ekaterina Kiryanova
Master Thesis Title	“Determinants of the innovation sourcing mode: comparison of Russia and Chile”
Faculty	Graduate school of management
Main field of study	080200 “Management” (specialization: General track)
Year	2017
Academic Advisor’s Name	D. Sc. Joan Freixanet Solervicens
Description of the goal, task and main results	The goal of the research study is to identify the external determinants of the decision of Russian and Chilean SMEs to engage in innovation activities and to choose the strategy of sourcing innovations. I have outlined the main factors of innovation ecosystem influencing the decision to innovate and tested it on two cross-sections of Russian and Chilean using the logistic regression analysis. The results demonstrated the difference in the influence of various external factors on the decision to innovate.
Keywords	Innovations, innovation ecosystem, innovation sourcing modes, external determinants of innovativeness

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Introduction

The concept of innovativeness is essential for businesses nowadays, as it determines their competitiveness, ability to react fast to the changing needs of the customers and, often, the possibility to survive on the market. According to the consultancy companies, innovational activities are drivers to faster the revenue growth and the long-term sustainable development of an enterprise. This study aims to analyze the factors of the innovation ecosystems that drive companies to choose one of the following innovation sourcing modes: investing in R&D in-house, collaborating with other companies or simply purchasing external technologies and innovative solutions.

Many studies focus on the internal determinants of companies' innovative performance on the firm level (Rothwell, 1994; Pascucci. 2011), though those factors can vary tremendously depending on a firm type and industry, and can be rather difficult to classify. That is why this study focuses on the external factors and innovation ecosystem context specifically, and its main *objective* is to find out the most influential determinants of innovation sourcing mode for the firms and compare the results for two countries – Chile and Russia. Thus, *the subject* of the study is the innovation strategy of a firm, which comprises, firstly, the decision to involve into some innovative activities, and, secondly, the choice of the innovation sourcing modes. *The object* of the study are the SMEs of both Chile and Russia.

As for the *research design*, firstly, the key external determinants of the innovation strategies have to be determined, secondly, the data on the decisions on R&D and assessment of the influence of the innovation ecosystem factors has to be collected – for both Chilean and Russian companies. In addition, finally, the regression analysis will be used to find out, what drivers matter in the decision making process and how they differ in context of those two countries. Two types of decisions of small and medium enterprises are considered in the research: (a) the firm's decision to engage into innovative activities; and (b) the choice of one of the three innovation sourcing strategies. Those strategies are the "MAKE" strategy to innovate in

R&D in-house, the "BUY" strategy to purchase innovations and technologies, and the "PARTNER" strategy to collaborate with other companies when investing in R&D.

The *research gap* of the study is connected with the fact that the existing studies focus either on the cross-cultural comparison of the innovation ecosystems or on the internal factors of companies that determine their specific decisions in terms of R&D. Thus, due to the scarcity of the previous studies in terms of assessing the influence of the innovation ecosystem's characteristics, this topic is relevant nowadays. *The main hypotheses* of the master thesis state that, on average, the SMEs are more eager to invest in the innovations in-house when assessing the bureaucratic environment, technology infrastructure, human capital sophistication and technology transfer factors as favorable. Likewise, on average, SMEs are more willing to buy innovations when assessing the creative outputs in the industry as high and to partner in case of high market sophistication.

Moreover, a thorough analysis of the two countries for the comparison will be conducted, those countries are Chile and Russia. There are three main reasons that prove the relevance of this inter-countries comparison. **Firstly,** Chile is an emerging market, which is the fastest developing economy of Latin America, but there is a scarcity of empirical studies on the innovations decisions in Russia and other emerging markets, except the BRICS countries. **Secondly**, Russia and Chile are positioned at the 43rd and the 44th places respectfully in the Global Innovation Rating, which makes it curious to compare their performance drivers. **Thirdly,** the fact of living in those two countries helped to gain me valuable insights about the two innovation ecosystems.

The main research questions for the study are: (1) what are the external determinants of the firms' decision to engage into innovative activities; (2) what are the possible strategies of innovation sourcing and what factors of innovation ecosystem influence that choice; (3) how do these determinants vary for the Chilean and Russian innovational context. To answer these research questions I collected the primary data from both Chilean and Russian companies, conducted a regression model to identify the statistically significant correlations and made a inter-countries comparison of the obtained results. The rest of the master thesis is organized as follows: in Section 1 the theoretical research on external determinants of innovation sourcing modes is conducted, in Section 2 the empirical methodology and the data collection process is described, and in Section 3 the results of the regression models are discussed and the managerial applications for both Russian and Chilean companies are provided.

1. Theoretical research on external determinants of innovation sourcing modes

1.1 The theories behind the influence of innovation ecosystem on business

To support the innovativeness of the firms within a business ecosystem, a complex approach is needed while acting in all the aspects of the institutional infrastructure (Metcalf and Georghiou, 1998). In opposition to the market failure approach, it is necessary to give attention to all the institutions in the innovation process, as well as to the efficiency of interactions among them (Nelson, 1962). From the systems perspective, the lack of attention to some of the elements leads to the "systems failure" because of the bad performance of its participants. Well-established regulatory and legislative environments are particularly important for the innovation support. The demand side of innovation plays an important role in the success of companies' R&D as well (Pavitt, 1998), as "it is the demands of the dynamic firms that stimulate the proximate development of the academic science base". Let us discuss the specific drivers that affect the companies' innovative performance within an ecosystem of a country.

1.1.1 Country analysis of the innovation context

Considering the problem of innovative development of companies within a specific country, it is necessary to pay attention to the existing conditions of institutional system and policies implemented in order to stimulate the activity of the private sector in terms of innovative performance. Involvement of the country's enterprises into R&D activities depends heavily on governmental policies background, but, on the other hand, "the key incentive for businesses to find new ways of doing things and to introduce various improvements in order to increase revenues, protect existing advantages, or pursue new opportunities, is *competition"* (Drucker, 1985).

Thus, micro-level innovation processes are determined by the match of the degree of innovational activity of an entity and its overall competitive strategy (Kuznetsova and Roud, 2011). The countries striving to foster innovations invested heavily in updating their methodological tools. Even considering one specific country it is inevitable to take into account the factors of globalization and increasing competition worldwide, where the condition for the company's survival is the creation and implementation of a clear long-term competitive strategy, which signs that a modern and efficient business model is established and developed.

To understand what determines the innovation ecosystem and allows comparing different ones, let us consider the indicators utilized to calculate the Global Innovation Index (GII). There are seven groups of factors that define the main areas of countries' performance:

(1) Institutions;

The block “Institutions” refers to the sphere of general environment for either existing or new companies and comprises the overall political environment, regulatory environment and business environment.

(2) Infrastructure;

The system’s infrastructure comprises general physical infrastructure, technological infrastructure and ecological sustainability, which determines the conditions for doing business in a country in terms of accessibility of the means to do business.

(3) Human capital and research;

This block is about the human resources possessed by a country and it includes three groups of factors as well: education, tertiary education, and research and development (R&D).

(4) Market sophistication;

Market characteristics are essential on the stage of development of a company, so it is necessary to take into account the credit accessibility, investment rules, as well as the trade, competition and market scale.

(5) Business sophistication;

The knowledge workers, innovation linkages and knowledge absorption determine the sophistication of business and give a complex outlook of the preferred types of business in a country.

(6) Knowledge and technology output;

This block of drivers covers the ability of a system to create knowledge and produce real technology outputs, which includes the knowledge creation ability, knowledge impact and knowledge diffusion.

(7) Creative outputs

The intangible assets, creative goods and services, online creativity of companies or citizens determines the level of creativity of a system and its participants.

1.1.2 Innovation policy terrain

"Innovation Policy Terrain" approach was suggested by The Organization for Economic Co-operation and Development in (Oslo Manual, 1997). In contrast to those papers that discuss innovations on the firm level and portray them as autonomous entities, the "Innovation Policy Terrain" gives a complex view on the factors influencing the innovation performance of companies and categorizes them into four major categories: innovation dynamo, transfer factors, science and engineering base and framework conditions reflected on the Figure 1.

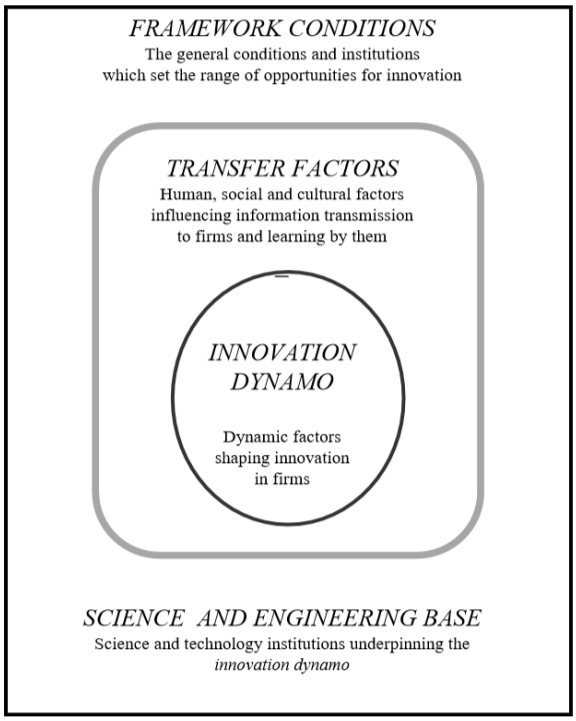

Figure 1. The innovation policy terrain. Source: OECD (1997)

Each of the four categories comprises a huge range of sub-factors, or framework conditions, influencing the transfer and absorption of technologies and knowledge (Figure 2).

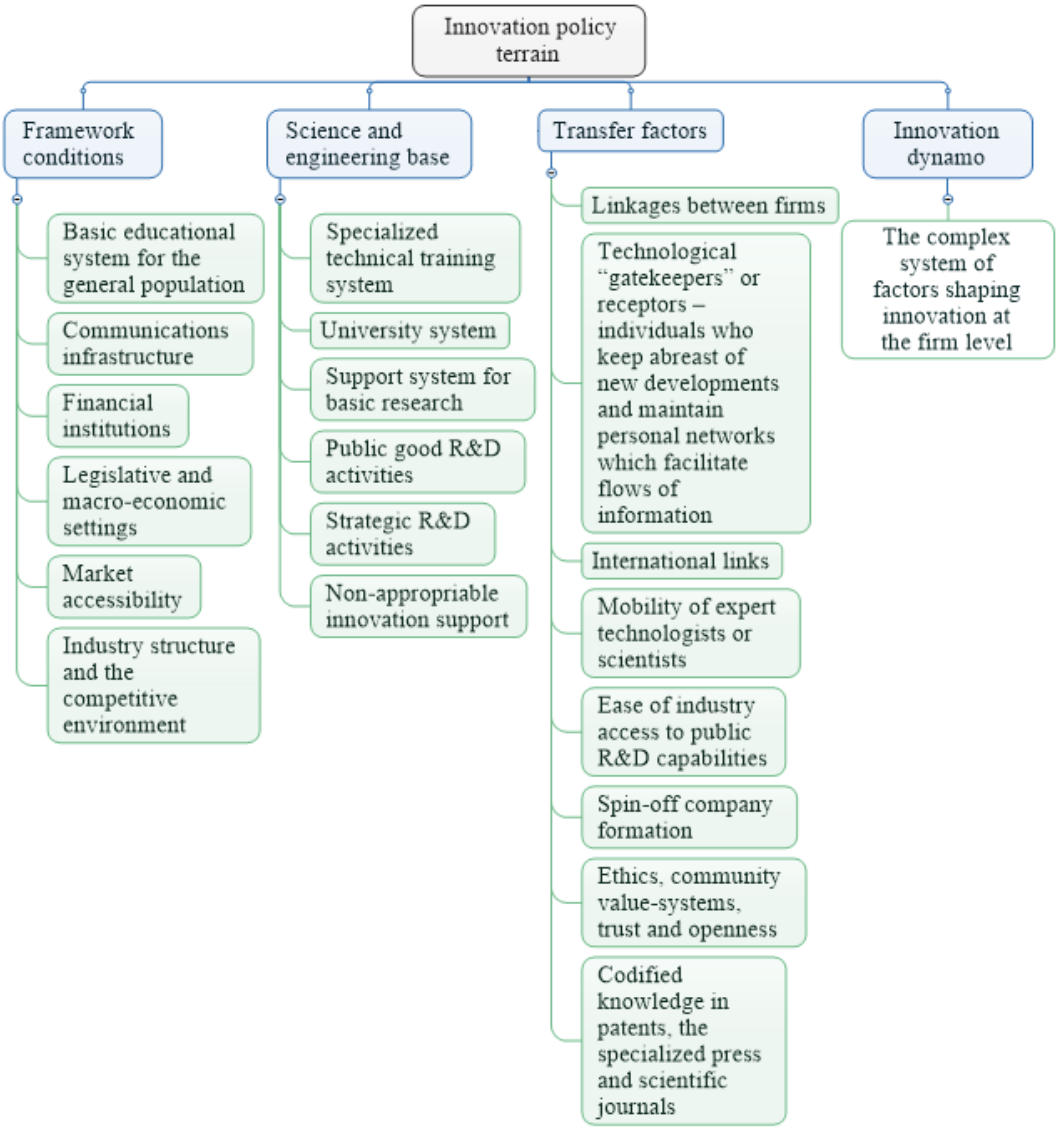

Figure 2. The innovation policy terrain - detailed view. Source: OECD (1997)

1.1.3 R&D management scheme

The innovation comes when an invention or an idea is commercialized, meaning that new technical, business-related, organizational, or societal solutions are implemented in companies. Innovation in a narrow sense affects the market launch of a new product or the start of a new production process. In the broad sense, it is the entire innovation process of invention and innovation. Thus, innovation management should be a part of a corporate strategy of a company and cover all of the tasks that are required to create technology know-how and to transform this know-how into marketable innovations. In other words, it comprises the development and commercialization of non-technological change processes as shown in the Figure 3.

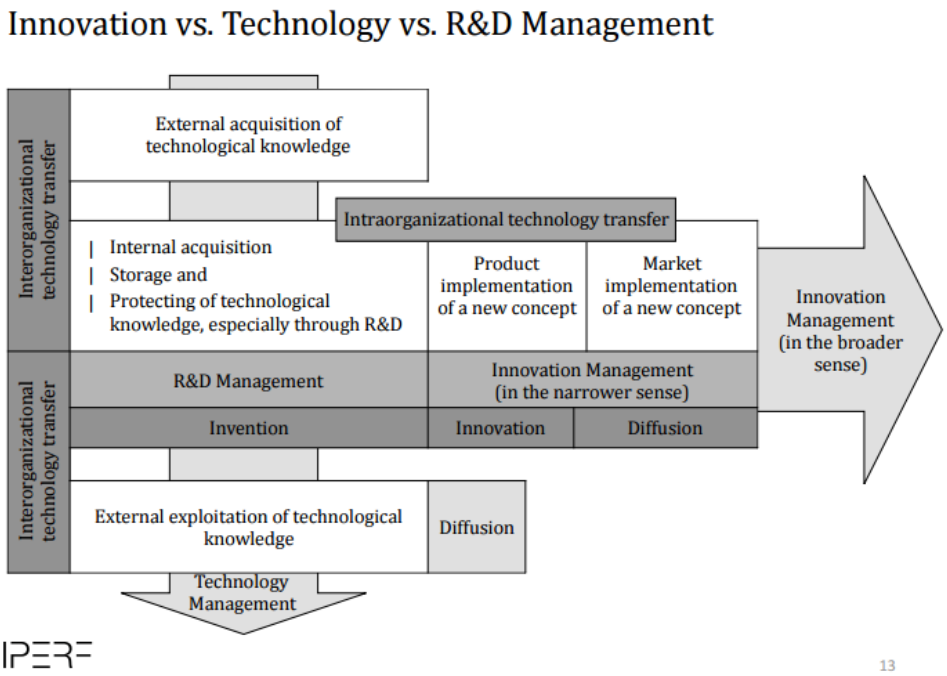

Figure 3. R&D management scheme. Source: Samsonowa T. (2016)

The idea of R&D management is relevant in the research, as while measuring the innovativeness of the firms, it is essential to take into account the innovations that create value for the company. It can be hard to measure the innovative performance and the exact financial benefits generated for the company after the innovation implementation, this is why this study aims to collect the primary data and let the firms assess their innovativeness. However, a degree to which companies are innovative in a specific country depends on many characteristics of business environment, governmental support, proper infrastructure for the technologies transfer, and the ability of businesses to absorb knowledge. Let me discuss those factors in the next sub-chapter.

1.1.4 The components of innovation ecosystem

The concept of innovation ecosystem comprises the actors involved in the process of creating the innovations and all the linkages and supporting institutions working in order to improve the technology performance of companies within a country. The ecosystem participants produce, distribute and apply different kinds of knowledge: enterprises, universities, public research institutes, etc. The performance of the innovation ecosystem depends heavily on the effectiveness of the processes of interaction of those subjects and how they relate to the technologies they use. There are many ways to define the innovation ecosystem, but let us focus on one definition summarizing the main points of the concept:

"... the network of institutions in the public and private sectors, whose activities and interactions initiate, import, modify and diffuse new technologies." (Freeman, 1987)

The innovation ecosystem model can be considered as a system connecting the macro-economic environment with the international trade environment, where the participant clusters are innovative firms, suppliers and competitors, financial organizations and venture capitalists, customers, education, training and research bodies, government, science, technology and R&D intermediaries as well as international participants (M. Eggink, 2013). As shown on the Figure 4, the innovative firms are in the center of the innovation system, having a significant contribution to the innovative activities. The interactions with foreign actors, such as multinational enterprises or foreign suppliers, influence the overall performance of an innovation ecosystem. The linkages between the elements of the system can be either formal or informal and can represent both knowledge and financial flows.

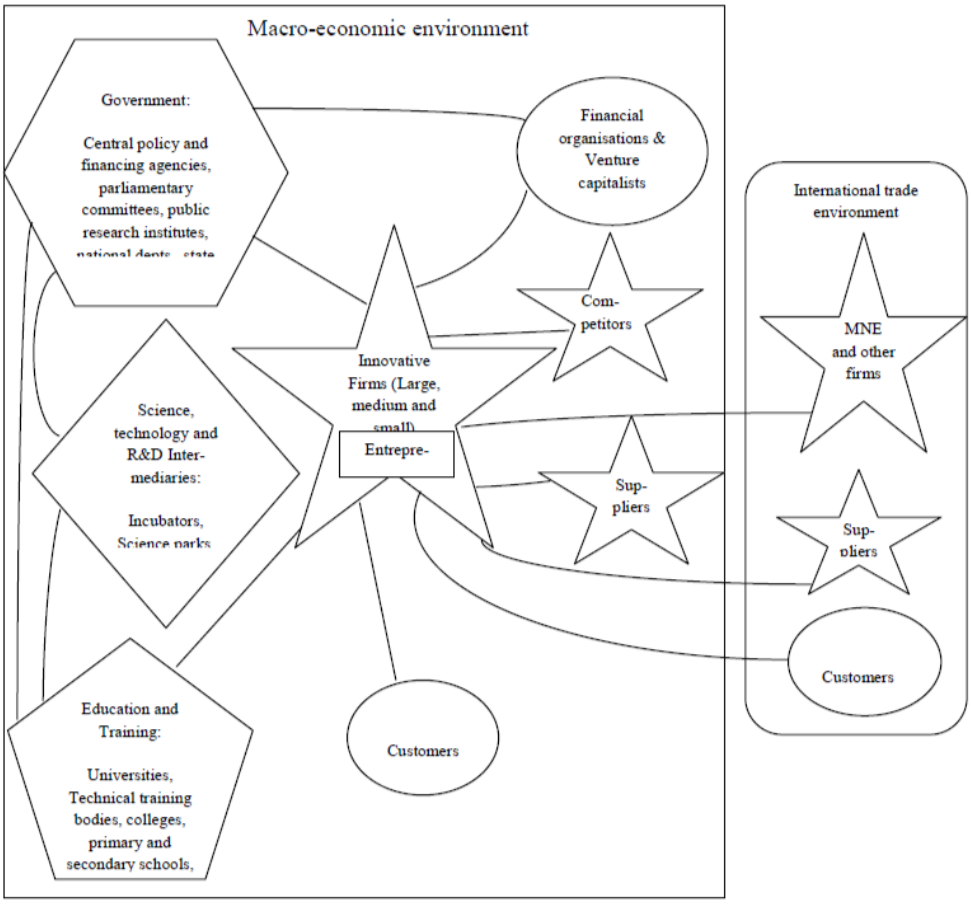

Figure 4: Innovation system framework. Source: M. Eggink (2013)

The linkages among participants should be of such a nature as to enhance the appropriate financial flows. As for the knowledge flows, they can be harder to distinguish as they are usually performed as indirect and informal linkages. The knowledge has to be transferred through human

resources from the education, training and research institutions to the firms, which would lead to an expansion of the system as a whole, and , consequently, to innovative activities and economic development.

1.1.5 Innovation sources modes

An ability of a company to generate a sustainable competitive advantage depends heavily on its ability to acquire, develop and apply technologies and innovations (Swan and Allred, 2003). There are three categories for the knowledge sourcing strategies. The first one refers to investing in technologies and developing them, which allow gaining the exclusive knowledge. (Scozzi et al., 2005) The second one refers to the purchase of external knowledge, but without any active cooperation with the source. (Subramanian and Nilakanta, 1996) The third one assumes active participation through innovation-cooperation in joint innovation projects with organizations. (Colombo and Garrone, 1996)

Williamson (2000) also discusses different strategies of the firms when engaging into innovations: doing R&D in-house and developing new technologies, which represents the firms' "MAKE" decision; acquiring technologies externally, obtaining them through the licensing agreements, outsourcing from the consulting or contractor agencies – this is the "BUY" decision. A third strategy, according to the author, is a hybrid strategy, which represents the mix of the first two strategies with some partnerships and cooperative agreements.

Let us summarize the three innovation sourcing modes:

(1) Investment in technologies in-house ("MAKE")
(2) Purchase of external knowledge ("BUY")
(3) Partnership and innovation-cooperation in joint projects ("PARTNER")

The decision on the choice of innovation strategy and the usage of either internal or external sources depends on the transaction costs associated with it. (Cassiman and Veugelers, 2006) However, in case of alternative external technology sources being available, the companies may substitute their in-house R&D with the external know-hows. (Von Zedtwitz and Gassmann, 2002)

The existing theoretical literature in the majority of cases classifies the technology sourcing strategies into the choice of either internal or external sourcing. (Neely et al., 2001). There are cases of combination strategies in terms of those two options. (Arora and Gambardella, 1994) However, the empirical evidence proves that the SMEs prefer rather to focus on way to deal with technologies: invest in it, purchase an external one or develop it in cooperation.

(Geroski and Machin, 1992) Thus, this research is aimed to figure out the determinants of choosing one of those strategies.

1.2 Determinants of the choice of the innovation sourcing mode

The groups of determinants are based on Oslo Manual taxonomy (OECD, 2005) and they are, **firstly,** the framework conditions, **secondly,** science and engineering base, and **thirdly,** the transfer factors, as shown on the Figure 3. However, the total number of sub-factors included is twenty, which is too much for building up a regression model due to possible problems with multicollinearity. This is why I refer to the classification of innovation ecosystem factors utilized in the Global Innovation Index calculation (GII, 2016), which are (1) Institutions; (2) Human capital sophistication; (3) Infrastructure access; (4) Market sophistication; (5) Business sophistication; (6) Knowledge and technology transfer; and (7) Creative outputs.

1.2.1 Framework conditions

The framework factors according to the Oslo Manual, (1997), comprise the following sub-factors: basic education system, communications infrastructure, financial institutions, legislative and microeconomic settings, market accessibility and industry competitive environment. As done in the Global Innovation Index approach, let us regroup those sub-factors into three new categories as follows: *bureaucratic issues*, *infrastructure access and market sophistication* (See Figure PPT).

Various types of tax incentives are used by the governments all over the world to foster the development and financial stability of different types of businesses, and the investigations show its positive influence on the technology, innovations and science as a whole (L. Gokhberg, 2014). The ease of the procedure, as well as the account of paying taxes is a huge concern of the governments when it comes to fostering innovations in a country (PwC, 2017). Moreover, out of many institutional and regulatory factors, the ease of paying taxes is essential, as it has to be done on the regular basis and takes extra efforts from companies in terms of time and money. The bureaucratic obstacles of doing business and engaging into the innovative activities are also discussed by many other authors (M. Hannele, J. Huhtala; William L. Krut; A. Styhre).

Financial position of the firm matters when it comes to engage into the R&D activities. The ease of getting credits is one of the most discussed issues by small and medium enterprises, which are eager to start innovating (EBRD, 2014). A technology can become a game changer for an industry, which is why for small businesses it is crucial to obtain the financing in order to invest into R&D (K. Mills, B. McCarthy, 2014). Thus, if companies can access external capital easily, this enables them have less constraints and obstacles in terms of innovations in-house

(Bena J, 2008). Thus, as for the “Bureaucratic issues” category, out of the eight factors presented in the GII model only two have a direct influence on an established business: “Ease of paying taxes” and “Ease of getting a credit”.

In terms of general infrastructure, to globalize a conclusion to all the SMEs disregarding the industries they are operating in, it is necessary to concentrate on the information and communication technologies, access to which is essential to innovate (P. Valbonesi, F. Biagi. 2016). To provide an example, the governments develop special ITC vouchers programs, aiming to solve the problem of reduced resources of small and medium enterprises and foster their R&D activities. Moreover, in today’s global economic environment, the responsibility of expanding economic opportunities lays on the regular citizens’ shoulders rather than on the government only. This assumes that small and medium-size businesses need to take the initiative and invest into in-house R&D or at least use the newly-appearing technologies (W. Kramer, 2007).

The third important framework condition that sets the context for the company’s decision making on innovation strategies is the market sophistication. This is determined by the market openness and the intensity of local competition. According to A. Tamirat (2013), the major drivers of innovativeness of small and medium enterprises are the internalization of businesses and the intensity of competition. Market openness offers companies new opportunities in terms of economies of scale and enhances the competitive pressures, which results in stimulating innovative solutions (OECD market openness principles, 2010). Moreover, it is crucial to have an open market to establish an effective technology diffusion process and adapt the world trends on the local market. (Hitt et al., 1997) The intensity of local competition may have different effects on the desire to innovate: on the one hand, the tougher the level of competition in the industry is, the higher the need to develop R&D is, in order to be competitive. Thus, companies may decide on either to engage into some innovative activities or not depending on its technological level compared with other companies in the industry. On the other hand, the empirical evidence presents the fact of giving up investing in R&D by companies, which face competition and deicide to just purchase the necessary technologies. (Gooroochurn and Hanley, 2007) Moreover, the market sophistication facilitates businesses to cooperate in terms of performing R&D activities (Arora and Gambardella, 1994).

1.2.2 Science and engineering base

When discussing the scientific base of an innovation ecosystem, it is common to mention the quality of the education, applicability of that knowledge in real business within the

ecosystem, as well as the real output of those activities resulted in new sustainable business models.

Various empirical studies discuss the positive correlation of the human capital sophistication and the innovative output of the firms (A. Uden et al., 2014; Gimeno et al., 1997). Human capital is considered an important source of competitive advantage for both firms and nations (Dakhli, De Clercq, 2004). As this research paper aims to study the innovative strategies on a firm level, it is necessary to discuss that human capital facilitates the development of knowledge, as well as the absorption of external knowledge for a company (Smith et al., 2005). There are few studies focusing on the relation between R&D outputs and human capital (Schneider et al., 2010), they mainly relate to the national level at the national level, though the effect of the human capital development in a country on innovation decisions of specific firms is not covered almost in the empirical studies (Goedhuys & Veugelers, 2012). The number of graduates in science within a country's innovation system matters in terms of giving companies an access to a high-qualified knowledgeable labor force (S. Semov, 2010). It can be a good indicator of measuring the human capital sophistication and the ability of local companies to engage in R&D activities in-house. Some studies (J. Winters, 2014) measure the effects of the number of graduates in science in the US on the innovation intensity as the number of patents or some positive linkages between the tertiary education and increase in research and development outputs of the firms and nations (R. Freeman, 2015).

The effectiveness of the innovation system of a country depends not only on the number of graduates from universities, but on the number of knowledge-intensive employees who bring their academic background to real business and help to foster innovations on a firm level. Many industry-specific businesses as well as the regional networks act as an important source of knowledge. (Savic M. et al., 2014) Thus, the number of people within a country that are involved in innovative activities full-time determine the overall R&D performance and the ability of companies to headhunter the experienced specialists to develop innovative approaches (J. Kuusisto, 2003). The parameter of knowledge-intensive employees can be used as an indicator of the overall business sophistication within an innovation ecosystem, as discussed by J. Galpin (2011). However, in such an environment a company also has an option to purchase innovations to avoid increasing the costs while trying to hire better professionals and over perform the existing players.

The science base as well has to be characterized by real outputs of knowledge-intensive activities by the firms and innovation clusters. To define the ability of companies in the

innovation ecosystem to generate some creative outputs can be measured by the business model creation in different industries. Business model innovation is one of the most discussed business topics nowadays, as in the age of tremendously fast developing technologies, new game changers appear every year, e.g. Amazon, Alibaba, RentACar, Netflix. Companies on the emerging markets have a choice to either acquire existing technologies and approaches of doing business from more developed countries, or to demonstrate the ability to create innovative outputs and extra value by introducing new ways of doing business (R. Amit, C. Zott, 2010). The business model innovation is used as a driver to the performance effects of small and medium enterprises (M. Hartmann, 2013), and the novelty-centered business design recombine the products, services and information in a new way, using the capacities of the highly educated specialists. However, in such an environment a company can rather purchase innovations to avoid increasing the costs while trying to replicate others' business models (A. Bonakdar, 2015).

1.2.3 Transfer factors

The role of knowledge and technology transfer within the business sector, as well as with universities, is essential to understand when studying the effects on the innovative strategic choices of firms. The formal and informal flows of knowledge and technologies contribute significantly to the performance and evolutions of innovation ecosystems by facilitating, sustaining and capitalizing the exogenous collaboration (S. Jofre, 2010). The strength of technological cooperation in business overall positively influences the involvement of those into the in-house R&D activities, while this emerge is considered to be a key enabling factor of the innovation process. (Crossing Boundaries, 2013) If discussing the institutional context and the influence of innovation ecosystem conditions on innovation decisions of specific firms, the strength of the technological cooperation between business sector and universities matters a lot in a decision-making process (C. Grimpe, K. Hussinger, 2010). Thus, the strength of knowledge transfer is a crucial framework condition that fosters companies to engage in innovative activities and creation of new business models.

1.2.4 All factors at one place

For your convenience, I have gathered all the factors at one place (See Figure 5). Thus, there are three main blocks of variables, two of which include three subcategories each, and they are determined by either one or two specific characteristics of the innovation ecosystem. These types of models are usually called "attributive", as the more concrete factors determine the more generic ones, which are displayed as dark blue and will become factors of a further used regression model.

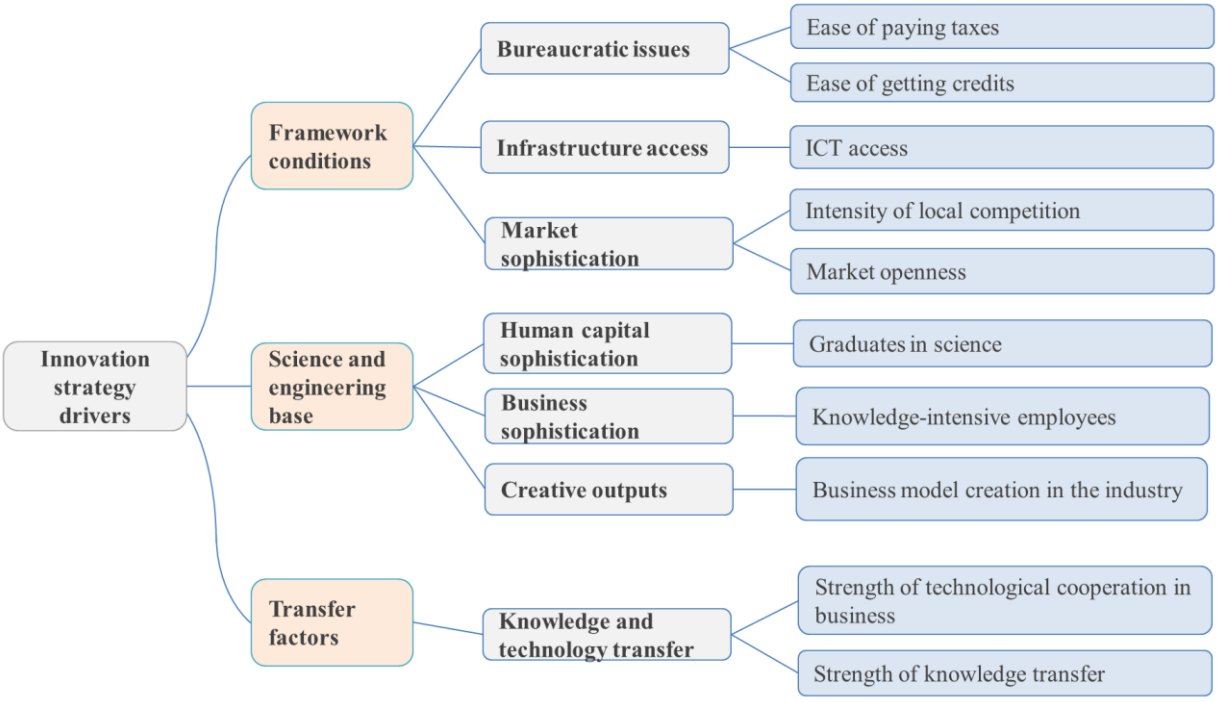

Figure 5. Innovation strategy drivers

1.3 Hypotheses of the study

Once having stated the determinants of the decision to innovate and to choose a specific source of innovations, let me state the hypothesis of the study.

1.3.1 Hypotheses for the decision to innovate

The better the framework conditions are, including the institutions development, infrastructure access and market sophistication, the higher the probability of a firm to be willing to innovate is.

Hypothesis 1: If a firm assesses the bureaucratic context as favorable, the probability of it engaging into innovative activities is higher.

Hypothesis 2: If a firm assesses the infrastructure access as very good, the probability of it engaging into innovative activities is higher.

Hypothesis 3: If a firm assesses the market sophistication as high, the probability of it engaging into innovative activities is lower.

The science and reengineering base in a country may have different effects on the decision to innovate. The human capital sophistication as well as the number of knowledge-intensive employees overall are expected to have a positive influence on innovativeness, while the ability of other businesses to create innovative business models and output has rather negative influence on the desire to innovate.

Hypothesis 4: If a firm assesses the human capital as sophisticated, the probability of it engaging into innovative activities is higher.

Hypothesis 5: If a firm assesses the business in the industry as sophisticated, the probability of it engaging into innovative activities is higher.

Hypothesis 6: If a firm assesses the ability of other businesses in the industry to generate creative outputs as high, the probability of it engaging into innovative activities is lower.

The knowledge and technology transfer factors are expected to have a positive influence on the innovativeness of small and medium enterprises.

Hypothesis 7: If a firm assesses the technology transfer as high, the probability of it engaging into innovative activities is higher.

The first set of the hypotheses is gathered in the Figure 6.

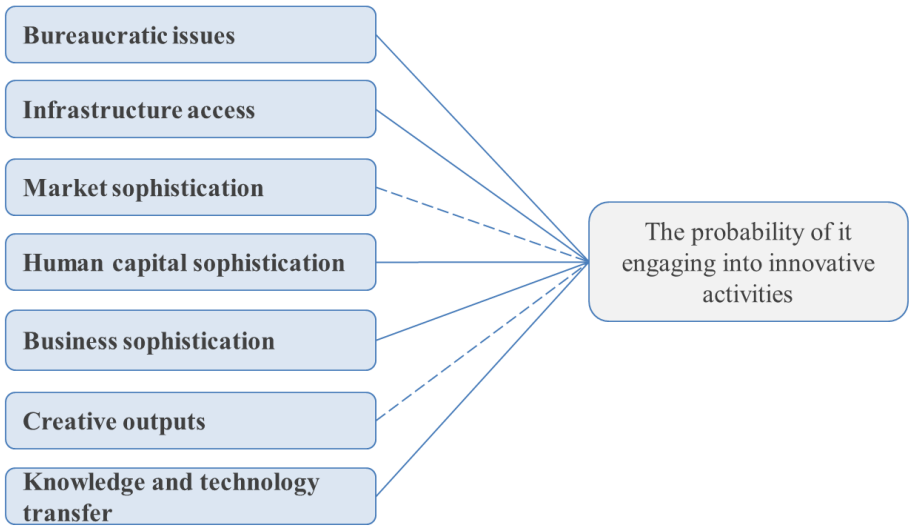

Figure 6. Hypotheses on the decision to innovate

1.3.2 Hypotheses for the decision on the innovation sourcing mode

The framework conditions make the bureaucratic processes easier and foster companies to innovate in-house.

Hypothesis 1: A firm that assesses the institutional context as favorable will be more inclined to choose the "MAKE" strategy.

Hypothesis 2: A firm assesses the infrastructure access as very good will be more inclined to choose the "MAKE" strategy.

The high market openness and intensity of local competition foster companies to decrease the risks of high R&D investment costs and collaborate with other companies when innovating.

Hypothesis 3: A firm that assesses the market sophistication as high will be more inclined to choose the "PARTNER" strategy.

The availability of the sophisticated knowledge intensive employees and many graduates in science is expected to lead companies to innovate in-house. However, in case other companies are successfully implementing creative business models, they rather "BUY" innovations.

Hypothesis 4: A firm that assesses the human capital as sophisticated will be more inclined to choose the "MAKE" strategy.

Hypothesis 5: A firm that assesses the business in the industry as sophisticated will be more inclined to choose the "MAKE" strategy.

Hypothesis 6: A firm that assesses the ability of other businesses in the industry to generate creative outputs as high will be more inclined to choose the "BUY" strategy.

Hypothesis 7: A firm that assesses the technology transfer as high will be more inclined to choose the "MAKE" strategy.

The second set of the hypotheses is gathered in the Figure 7.

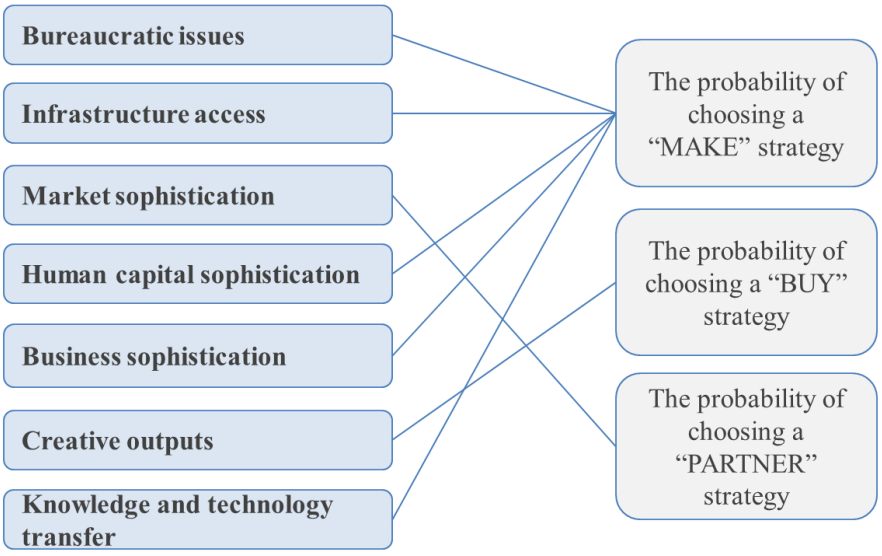

Figure 7. Hypotheses on the choice of the innovation sourcing mode

1.3.3 Hypotheses for the comparison of Chile and Russia

In order to be able to compare the results of the two regression models, it is necessary to consider the historical development of the components of the countries' innovative context. For that reason, the data from the Global Innovative Index reports for the period from 2010 to 2016 have been gathered, as presented on the graphs of this sub-chapter. To make the assumptions regarding the innovation ecosystems context of those two countries, let me compare the indicators in dynamics and discuss the comparative performance.

0. Overall index

From the year of 2010, Chile has moved from the 40th to the 44th place in the Global Innovation Ranking, while Russia has changed its position from the 64th to the 43rd place. Though Russia had a drop in its position in the year 2013, overall trend shows its positive transformation of the Innovation System if compared to other countries' performance. Chile has shown a slightly negative trend in its innovative performance during the last 7 years with a drop in the year 2013 as well and further stabilizing by the year 2015 (See Figure 8).

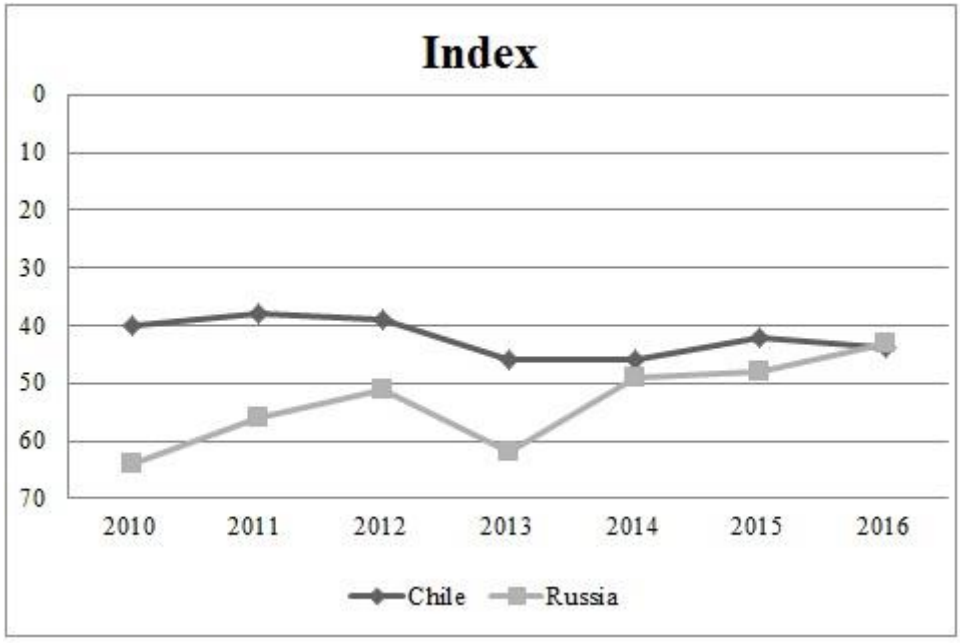

Figure 8. The Global Innovation Index: comparison of Russia and Chile, 2010-2016

1. Bureaucratic issues

The group of indicators, which characterize the institutional environment in the country, differ a lot in Russia and Chile. As of the year 2016, Russia is positioned as the 73rd country in the Global Innovation Ranking, while Chile is put on the 37th place. There are three indicators

determining the overall "Institutions" score: political environment, regulatory environment and business environment (See Figure 9).

As for the *political environment*, Russia is placed the 93rd, while Chile – 34th. This is because Russia struggles with its Government's effectiveness and has an extremely week score for its "Political stability and absence of violence/terrorism", being the 104th in the list.

As for the *regulatory environment*, the ranks for Chile and Russia are 44 and 92 respectively, which is explained by a very strong position of Chile in terms of the regulatory quality and the rule of law (17th and 22nd places respectfully), while these two at the same time can be named as very week points of Russian system (97th and 104th places respectfully). However, the cost of redundancy dismissal as a sub-factor represents a week point for Chile, where it is positioned on the 106th place, and Russia – on the 75th.

As for the *business environment*, the positions of the two countries are more comparable – the ranks for Chile and Russia are 45 and 41 respectively, so Chile is underperforming. The ease of starting a business and the ease of resolving insolvency is higher in Russia, while the ease of paying taxes is higher in Chile.

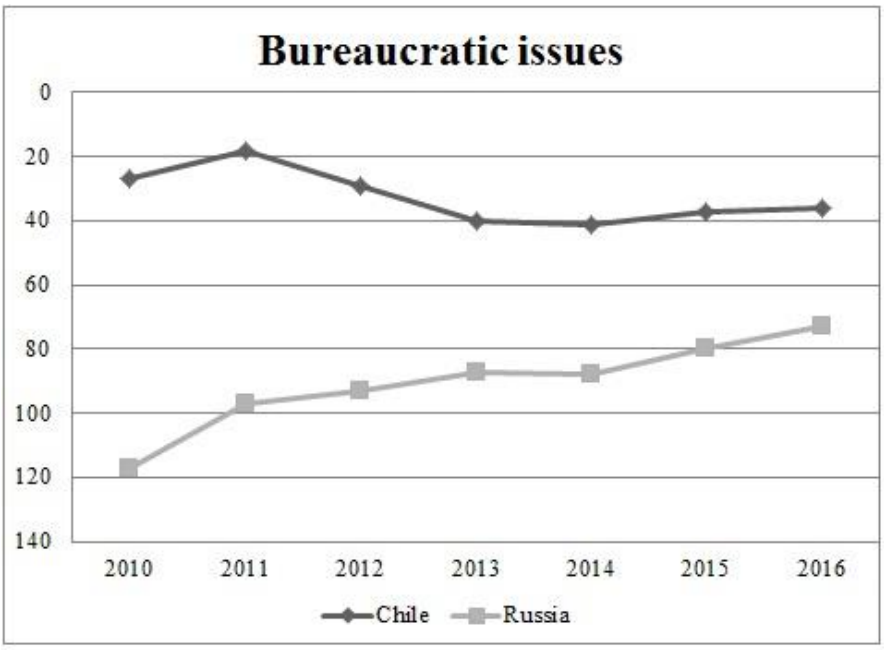

Figure 9. The GII: institutions comparison in Russia and Chile, 2010-2016

2. Infrastructure

The overall performance of Chile in terms of general infrastructure and the infrastructure for innovations is better that the one of Russia (38th place against the 60th respectively). Looking at the indicator in dynamics, let us notice that Chile has strengthened its position from the 48th to

38th place, while Russia has gone down from the 51st to the 60th position (See Figure 10). The three sub-factors are information and communication technologies (ICTs), general infrastructure and ecological sustainability.

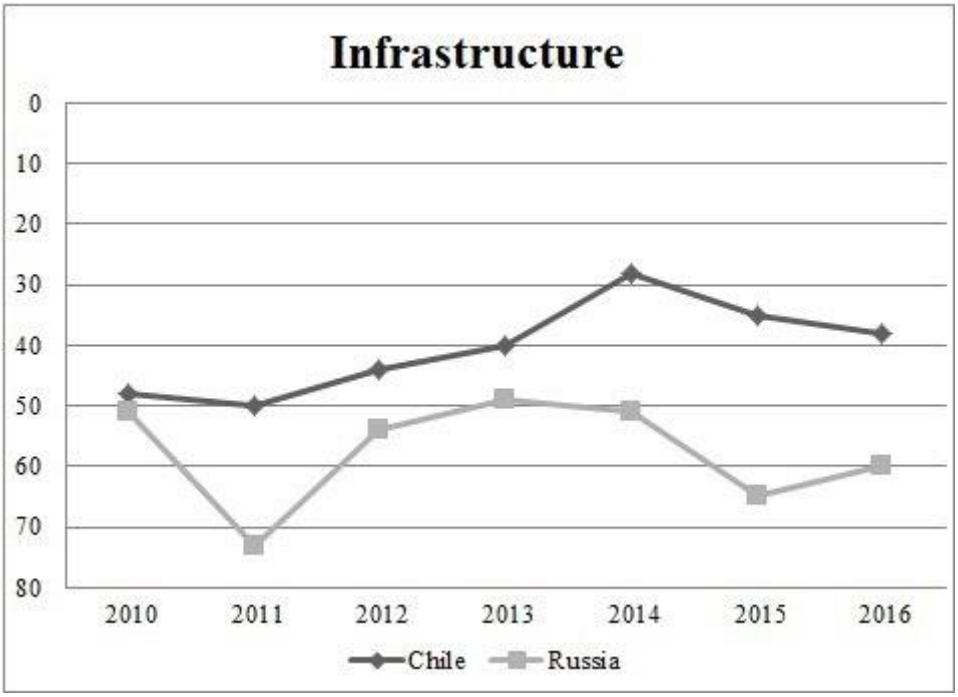

Figure 10. The GII: infrastructure comparison in Russia and Chile, 2010-2016

Curiously the ICT access and ICT use, as the sub-factors of *"information and communication technologies"* driver, are better in Russia, but Chile's government's online service and online e-participation are its major strengths (16th and 7th places accordingly).

As for the *general infrastructure*, Russia is better positioned in "Electricity production", measured at the terminals of all alternator sets in a station (the 23rd place against the 48th of Chile), but logistics performance and gross capital formation are the factors of danger for Russia, which negatively influence the country's performance in that sense (the 95th place against the 60th of Chile).

Russia is worse positioned in terms of ecological sustainability as well, it ranked as the 114th country according to its sub-factor of "GDP per unit of energy use", and 91st – to its "ISO 14001 environmental certificates" sub-factor. However, the overall environmental performance is better in Russia (ranked 32nd compared to 51st place of Chile).

3. Human capital & research

The aspect of the development of the human capital differs in Chile and Russia as well: starting from close positions in the ranking in the year 2010, countries has shown various

performance after the seven years. Russia has been able to show stable growth during the period, moving from the 46th to 23rd place in the ranking. As for Chile, it experienced a significant downturn in the year of 2011 to reach the 75th place in 2012, so by 2016 the country ended up taking the 62nd place in the list. Thus, nowadays Russia is positioned much better in terms of human capital and research. The three groups of factors comprise education, tertiary education, and research and development (See Figure 11).

The sub-factor of *education* is one of the important determinates of the overall score, as the ranks of Chile and Russia are 73 and 27 respectively. Given the relatively comparable expenditures on education as a percentage of GDP in both countries, Chile performs very bad in terms of the government expenditure on secondary education per pupil (84th place), assessment in reading, mathematics, and science (45th place), and the pupil-teacher ratio (86th place). School life expectancy makes Chile better positioned in the ranking than Russia, but due to the very high pupil-teacher ratio, where Russia is put on the 16th place in the list, the education in general performs better there.

As for the *tertiary education*, tertiary enrolment is strong both in Chile and Russia (9th and 18th places accordingly). The "graduates in science and engineering" sub-factor is very strong in case of Russia, which takes the 11th place while Chile – only 61st. The tertiary inbound mobility is quite low in both cases, but for Chile it is a significant weakness – only the 95th place.

Russia is better positioned in terms of *R&D* as well – 25th place for Russia against the 49th for Chile. Russia possesses a bigger number of researchers, has a significantly higher GERD (Gross expenditure on R&D) and a comparable QS university ranking average score for the top three universities. However, the sub-factor of average expenditure on R&D of the top three global companies in a country is very low for Chile, with makes a big weakness out of it and places the country in the 45th position.

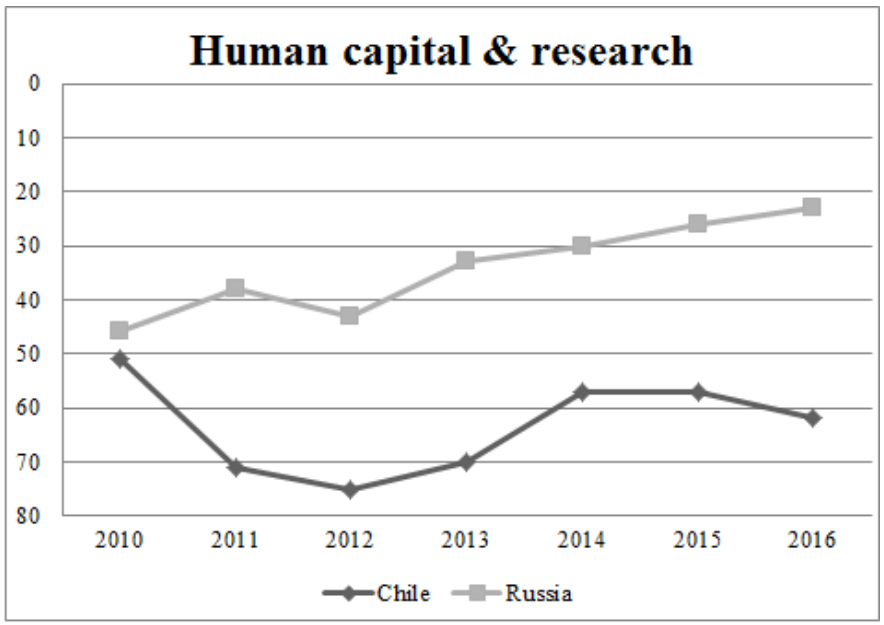

Figure 11. The GII: human capital sophistication comparison in Russia and Chile, 2010-2016

4. Market sophistication

In terms of market sophistication, Chile has a relatively better position than Russia – ranked 41st against 63rd, and during the period of the last seven years Chile has been relatively stable in terms of market sophistication – it has changed its position from 41st to the 47th overall. As for Russia, it started from a bad 97th position, got better in the next few years, during the years of 2014 and 2015 all the political and economic drivers led to falling down till the 111th place, but it got back to the 63th place in the year of 2016 (See Figure 12).

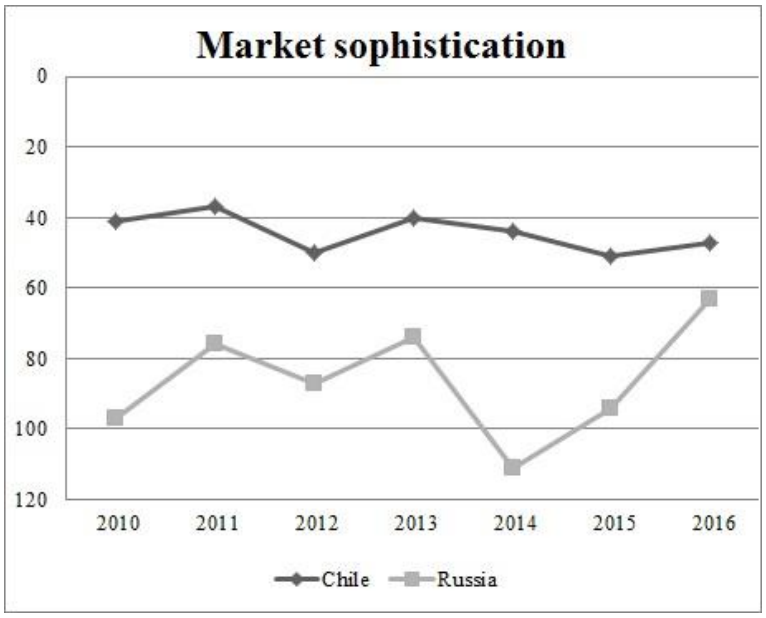

Figure 12. The GII: market sophistication comparison in Russia and Chile, 2010-2016

The sub-factor of *credit* is overall better for Chile (65th place against the 80th), which is determined by, firstly, domestic credit to private sector, or financial resources provided to the private sector by financial corporations, positioned better in Chile (23rd place against the 52nd). Secondly, the combined gross loan balances per microfinance institution as a share of GDP, named as microfinance institutions' gross loan portfolio, is a weak point for Russia, taking only 72nd place in the overall rating considering that indicator. However, the ease of getting credit is assessed to be significantly better in Russia (39th against the 69th for Chile).

The investment environment is a significant weakness of Russia as a group of factors: the country the 107th place in the ranking, while Chile – the 87th. Chile is characterized by the ease of protecting minority investors and its overall market capitalization, which is a huge strength for the country (16th place against the 64th for Russia). The total value of stocks traded does not differ much for the two countries, as well as the venture capital deals, which is a weak point for both (84th place for Chile and 67th for Russia).

Both Chile and Russia are quite strong in terms of *trade, competition, & market scale* (30th and 22nd places respectfully), though they represent very different results on every sub-factor. Thus, the weighted mean of the applied tariff rate is relatively better for Chile (47th place against the 93rd in Russia). Chile as well has a strong a high score of the intensity of local competition (21st place), while Russia is very strong in its domestic market scale (6th place).

5. Business sophistication

The factor of business sophistication is interesting to compare, as both Russia and Chile keep up with each other from time to time during the period. Russia improved significantly in the year 2011 up to the 37th position , being a bit ahead of Chile, then went down a bit in the 2014 (60th place for Russia and 46th for Chile), and finally in the year of 2016 Russia is on the 37th position and Chile – the 41st (See Figure 13).

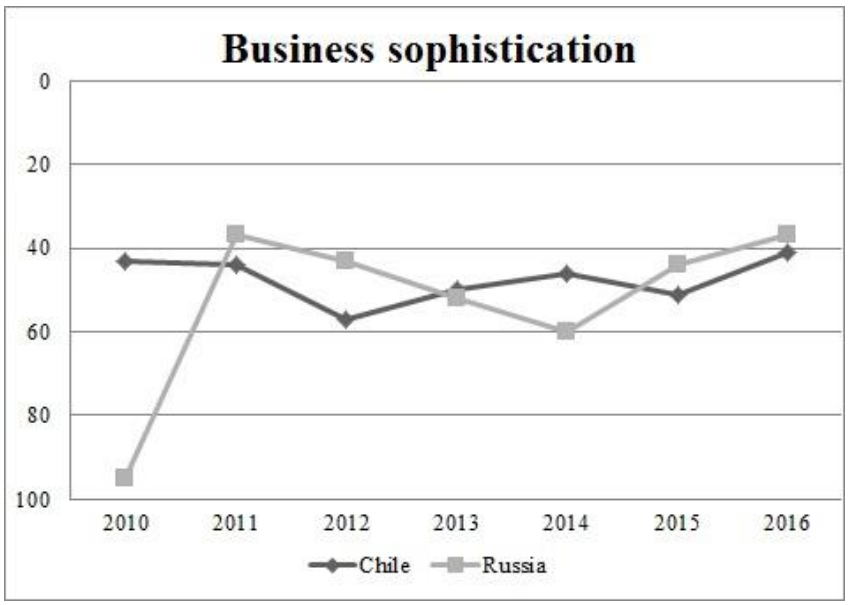

Figure 13. The GII: business sophistication comparison in Russia and Chile, 2010-2016

The fist sub-driver is about *knowledge workers*, and Russia performs a bit better in that sense: 24th place against the 45th for Chile. Employment in knowledge-intensive services is a strong point for Russia (14th place), while Chile performs well in terms of the firms offering formal training (14th place). GERD performed by business enterprise is higher in Russia, but if we take the indicator of GERD financed by business enterprise, Chile shows slightly better results. It worth mentioning that Russia is ranked second according to the percentage of females employed with advanced degrees out of total employed.

As for the *innovation linkages*, it is a weak point for Russia, which is placed the 112th in the ranking, due to a very weak state of cluster development (101st place), and very low percentage of GERD financed by abroad (76th place). Chile performs better in terms of the "university/industry research collaboration", "joint venture/strategic alliance deals" and "patent families filed in at least two offices" sub-factors.

The *knowledge absorption* is comparable in two countries (36th place for Chile and 35th for Russia), but once again – due to different drivers. Intellectual property payments is a strength for Russia (14th place), ICT services imports and research talent in business enterprise are quite strong as well. High tech imports are comparable in Chile and Russia (53rd and 54th places respectfully). However, the net inflows of foreign direct investment remains a strong side for Chile (16th place in comparison to Russia's 95th).

6. Knowledge & technology outputs

Russia in dynamics shows a better performance in terms of knowledge & technology outputs, being at the 40th place in the ranking and over performing Chile by 19 points (59th place), as shown on the Figure 14.

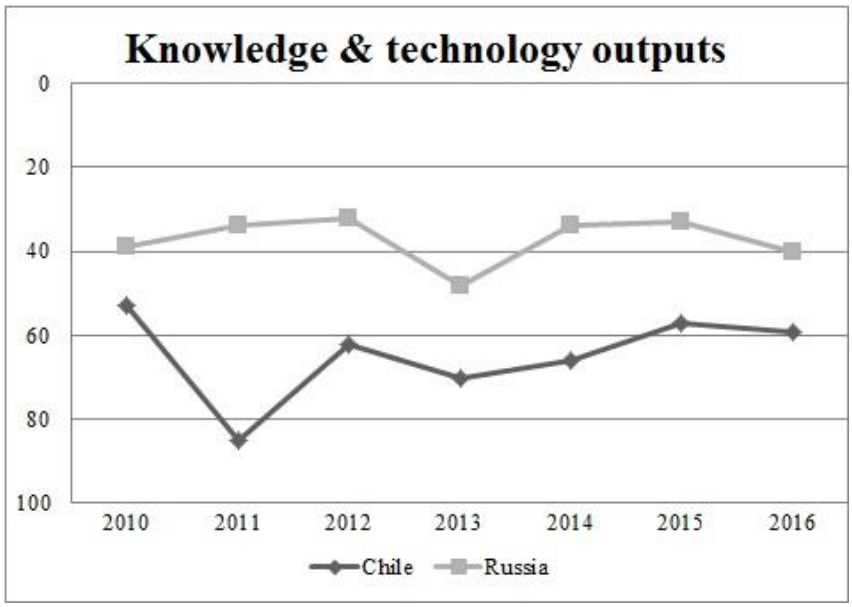

Figure 14. The GII: knowledge & technology output comparison in Russia and Chile, 2010-2016

Russia is stronger in terms of *knowledge creation* (23rd place against the 59th in Chile), and "Patent applications by origin" (18th place) and "Utility model applications by origin" (7th place) are the two strengths of the country. Russia is strong in terms of the citable documents H index as well (21st place), but Chile performs better according to the indicators of "PCT international applications by origin" and "Scientific and technical publications".

In terms of *knowledge impact*, Chile shoes better results: 52nd place against the 82nd for Russia, taking an advantage of its new business density (14th place), total computer software spending and ISO 9001 quality certificate. The growth rate of GDP per person engaged in a weak point for both countries.

Chile is overall a bit better in *knowledge diffusion*, showing a great performance in terms of the net outflows of foreign direct investment (6th place), but being worse than Russia in Intellectual property receipts, high-tech exports and ICT services exports.

7. Creative outputs

The creative outputs has been better in Chile during the period 2010-2016, in the year of 2012 Chile was placed 16th in the ranking, while Russia was 101st in 2013. By the year of 2016 the countries got closer in the ranking – Chile went down to the 55th place, and Russia – up to the 66th, but Chile is still placed higher (See Figure 15).

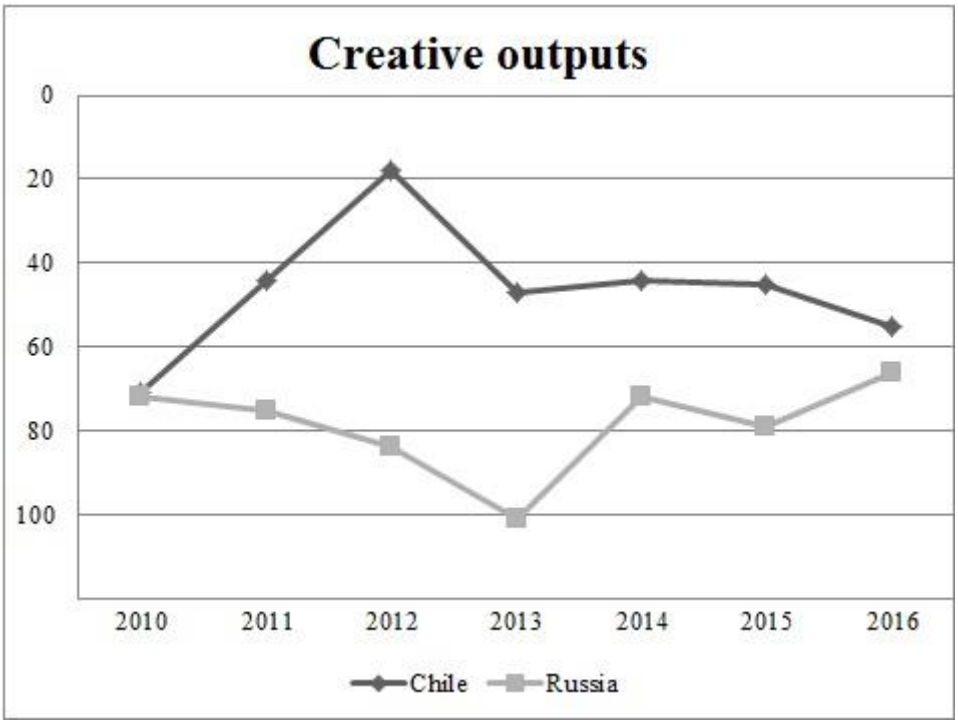

Figure 15. The GII: creative output comparison in Russia and Chile, 2010-2016

The first driver is *the intangible assets*, where Chile is placed 49th, and Russia – 89th, taking into account the weak points for Chile - 93rd place in industrial designs by origin. However, the country is good in terms of the trademark application class counted by origin (22nd place), good ICTs and organizational model creation, and 30th place in ICTs and business model creation, where Russia struggles a lot being 94th positioned.

Russia shows a good performance in *creative goods and services* (59th place), where Chile struggles taking only the 99th place in the list. Russia's strength is cultural and creative services exports (11th place), as well as creative goods exports (47th place). Chile has a small competitive advantage in the global entertainment and media market and national feature films produced.

In terms of *online creativity* Chile again shows better performance than Russia (38th and 46th places respectfully), Wikipedia monthly edits is quite high in Chile (21st place). Russia is a bit weaker in generic top-level domains, but a bit stronger in the country-code top-level domains and video uploads on YouTube.

Let me summarize the historical differences between the countries at one place (See Table 1)

Hyp. #	Comparison factor	Chile	Russia
1	Institutions development	Higher	
2	Human capital and R&D		Higher
3	Infrastructure	Higher	
4	Market sophistication	Higher	
5	Business sophistication		Higher
6	Knowledge & technology outputs		Higher
7	Creative output	Higher	

Table 1. GII historical evidence for Chile and Russia

As for the hypotheses statement for the countries comparison, the results for each of the seven variables will be compared with the usage of the t-test, while the relative position of countries regarding each of the factors will be compared using the mean values. The status quo hypotheses are formulated as neutral, thus, the seven hypotheses can be stated as follows:

Hypothesis 1: There is no difference between institutions development in Russia and Chile;

Hypothesis 2: There is no difference between human capital and research in Russia and Chile;

Hypothesis 3: There is no difference between infrastructure development in Russia and Chile;

Hypothesis 4: There is no difference between market sophistication in Russia and Chile;

Hypothesis 5: There is no difference between business sophistication in Russia and Chile;

Hypothesis 6: There is no difference between knowledge & technology outputs in Russia and Chile;

Hypothesis 7: There is no difference between creative output in Russia and Chile.

2. Empirical methodology and data

This chapter comprises the insights on the variables included into the theoretical model, on the data collection method, the information regarding the research sample as well as the questionnaire design. The chapter covers three questions:

(1) dependent and independent variables, (2) questionnaire design and (3) research sample description.

2.1 Variables included in the model

Based on the previous theoretical research, the conceptual model for further investigation is presented (See Figure 5). After having built the conceptual model, let me explain how to measure the factors included into it.

2.1.1 Dependent variables

Within this paper, the terminology utilized by Swan et al. (2003) is adapted, which utilizes the concept of "innovation strategy of a firm" as a combination of those two decisions of businesses regarding the innovation activities are discussed: a decision to innovate and a choice on the a innovation sourcing strategy.

The first dependent variable is a dummy variable, which equals one in case a company does some R&D activities and has a positive innovation budget, and zero when it does not engage in any innovative activities, has no spendings on R&D and no employees are working full-time as researchers. If the firms participated in the survey distinguished between being either innovating or non-innovating, I could build up a logistic regression to find out the determinants of that decision by companies.

The second dependent variable deals with the decision to choose the way to treat innovations and technologies in a company, it is a categorical variable that comprises three mutually exclusive levels: 1 = MAKE, 2 = BUY and 3 = PARTNER. Let me describe each category in order to give the criteria for distinguishing the strategies:

- "Invest in innovations in-house (MAKE)" is a strategy that assumes developing R&D activities within the company.
- "Out-sourcing innovation (BUY)" is a strategy to purchase innovations, patents, know-hows from other companies in order to introduce new processes and products.
- "Invest in collaboration (PARTNER)" is a strategy that assumes that several companies unite their capital to generate R&D activities.

The information on the dependent variables is shown in the Table 2.

2.1.2 Independent variables

The model comprises three groups of independent variables: framework conditions, science and engineering base and transfer factors. Let me further describe how to measure those variables.

Framework conditions:

- The bureaucratic issues, which comprise two sub-factors – the ease of paying taxes and the ease of getting credits.
- The infrastructure access: the access to the information and communication technologies in a country in order to do business.

Science and engineering base:

- Human capital sophistication: availability of the qualified personnel for conducting the research and development activities in a company, particularly – graduates in science.
- Market sophistication: shows the market openness to innovations and international connections, as well as the intensity of local competition.
- Business sophistication: the availability on the market of knowledge-intensive companies with a respecting range of sophisticated tasks for the personnel.
- Creative outputs: states for the ability of the firms to create new business models.

Transfer factors

- Knowledge and technology transfer: the strength of existing technological cooperation in business, as well as the strength of knowledge transfer and cooperation of business with universities.

#	**Concept**	**Measurement**	**Variable type**	**Name in SPSS**
	Dependent variables			
1	Decision to innovate	Dummy for innovativeness: the firm has conducted R&D activities ever	Dummy	INNOVA
2	Sourcing mode: MAKE	Dummy for investing in R&D: 1 if the firm has ever undertaken R&D activities in-house	Dummy	MAKE

3	Sourcing mode: BUY	Dummy for outsourcing R&D: 1 if the firm has acquired external sources of technologies and innovation	Dummy	BUY
4	Sourcing mode: PARTNER	Dummy for partnering in R&D: 1 if the firm has collaborated with some other to generate R&D	Dummy	PRTN
	Independent variables			
5	Bureaucratic issues	Quality of institutional development of a country in relation to bureaucracy	Numerical	INST
6	Infrastructure	Degree of the infrastructure availability for companies	Numerical	INFR
7	Human capital sophistication	Quality of human resources in a country	Numerical	HUMC
8	Market sophistication	Market openness in terms of innovations	Numerical	MARK
9	Business sophistication	Availability of the knowledge intensive personnel in a country	Numerical	BUSN
10	Creative outputs	Ability of local companies to generate creative outputs in business	Numerical	CREO
11	Knowledge and technology transfer	Quality of knowledge and technology transfer	Numerical	TRNF

Table 2. Variables in the regression model

2.2 Questionnaire design

The data needed for the research was not available in any database due to the specific design of the study: SMEs' perception of their innovativeness and external factors of the innovation ecosystem was needed. Moreover, there was no secondary data available when it comes to the SMEs' decision on the innovation sources, so I decided to use an electronic questionnaire to collect the primary data with the responses of companies' representatives. The form of the questionnaire was the same both for Chilean and Russian enterprises.

The questions in the survey are divided into two main groups: general information on the respondent and the company he or she is working for, and study-related specific questions. An example of a general question is presented on the Figure 16:

1. Please, indicate the name of the company you are working for.
2. How many employees does your company have?
3. Please, indicate your sex.
4. Please, indicate your age.

Figure 16. Examples of the general questions

Specific questions aim to get a person's understanding on how the external factors of innovation environment in their country affects their business (See Figure 17).

Knowledge and technology transfer

15. Assess the strength of the technological cooperation in business for your country
    (-5) very weak … (5) very strong
16. Assess the strength of knowledge and technology transfer in your country
    (-5) very weak … (5) very strong

Figure 17. An example of the questions about the company's processes

A detailed questionnaire is presented in the Appendix 1.

2.3 Research sample

This research paper aims to find out the main external drivers on SMEs' innovative activities and compare the results for Chile and Russia. Two samples of companies of each country have to be used to represent the huge population of those, which is why it was needed to select a sampling method to collect the cross-sectional data. Due to the fact that I had access to the databases of companies, any kind of probability-based sampling could be biased (See the Figure 18). That is why the most relevant sampling method was a self-selection sampling method. This is a method that assumes that the individuals take part in the survey on the voluntary basis, assuming that their interest shows that either the respondent him- or herself professionally or the company he/she works for are somehow connected with innovation activities or sourcing. The high interest and involvement of the participants to the survey topic may positively affect the quality of the survey results. (Saunders, Thornhill and Lewis, 2009)

Although the usage of a non-probability sampling method makes it harder to generalize the results to the whole population, my research required that the majority of companies had at least one type of innovation adapted. To reach this, an extremely big sample had to be created in order to use a probability sampling method, especially taking into account the e-mail opening

rate not higher than 10% on average. This is why it is not rational to use the probability sampling techniques in the research.

As for the method of data collection, to collect the primary data I had to approach both Chilean and Russian SMEs. According to the modern criteria of small and medium enterprises[1], the number of employees of the companies in the sample did not have to exceed 250 persons. This was assured by the initial criteria of the choice of the companies for the pool. The questionnaire was sent to the e-mail of the Russian companies from the GSOM database, used by J. Freixanet and I. Churakova for the other research on the innovation performance of Russian small and medium enterprises. Thus, the total number of recipients was 251, you can see the general information about the sample further in this chapter. As for the Chilean companies, they were reached by using the sources of the jobsite "Chiletrabajos", where I worked previously as a business developer. The database of the contacts of companies they possess consists of more than 8000 enterprises that register on their website to search for talent, out of which around 2000 belonged to SMEs, so finally around 160 companies has opened the e-mail, and 89 answered the survey.

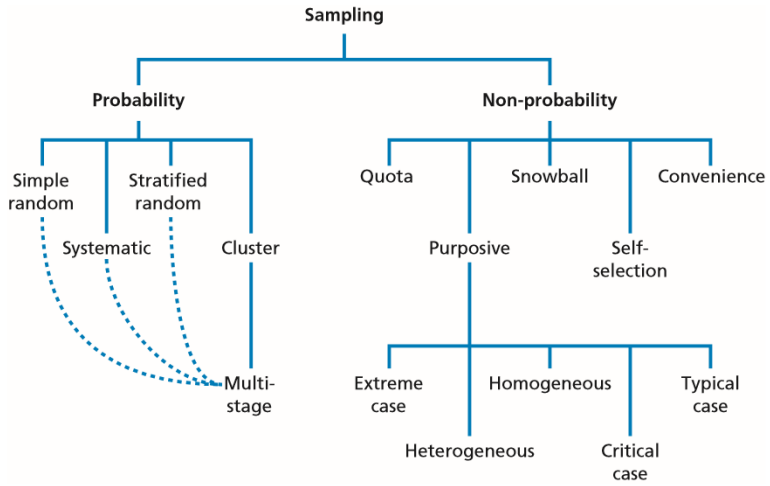

Figure 18. Sampling methods. Source: Saunders, Thornhill and Lewis (2009)

The sample size to build a regression model depends on the number of factors in the model and the expected effect called R^2. The more variables the model has and the less expected effect is, the bigger the sample should be. As there are seven independent variables, and the R^2 in the "decision to innovate" model for Chile and Russia are equal to 0.501 and 0.568 respectfully, and the R^2 in the "innovation source" models are equal to 0.793 and 0.828 respectfully. Thus, I have used the graph presented in the textbook of Field (2013) to calculate the number of required

[1] http://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition_en

observations, and the minimum numbers of independent variables for the model equaled 70. Thus, the amount of responses collected were 89 and 85 for Chile and Russia respectfully, considering the probability of people not answering all the questions of the questionnaire. After a stepwise exclusion the models consisted of 84 and 81 observations respectfully.

Table 3 presents the discriptive statistics of the decision to innovate and the decision to choose the innovation strategy for Chile and Russia. Out of the 84 observations in Chile 37, or, in other words, 55% of the companies are not developing R&D activities. As for Russia, out of 81 observations 32 companies are not innovating, which represents 40% of the sample.

Country	**Innovativeness**		**Innovation strategy**		
	INNOVATE	DON'T INNOVATE	MAKE	BUY	PARTNER
Chile	38	46	23	46	15
Russia	49	32	44	30	7
TOTAL	**87**	**78**	**67**	**76**	**22**

Table 3: Innovativeness and innovation strategy by country

The logistic model adaquacy was checked using the Hosmer–Lemeshow test, and the model with the Prob>chi^2 = 0.945 describes the sample quite well. Then, the ROC-analysis was conducted, and the area under the ROC-curve was equal to 0.913, which shows a relatively high predictive power of the model (AUC > 0.9). The tests for heteroscedasticity were not conducted, since logit models are heteroscedastic by definition. The problem of multicollenearity has been checked by building a corellation matrix, where the highest partial correlation coefficient was 0.156, which is unsignificant for that study (See Appendix 2). I also tested the Variance Inflation Factor, which turned out to be 1.26, which means the multicollinearity is negligible or absent in the model.

2.3.1 Descriptive statistics: Chile

The research does not assume capturing specific for various economic sectors differences, but is it useful to analyze the distribution of the companies according to its sizes.

The Figure 19 shows the distribution plot and indicates the mean of 33 employees for the sample of Chilean companies.

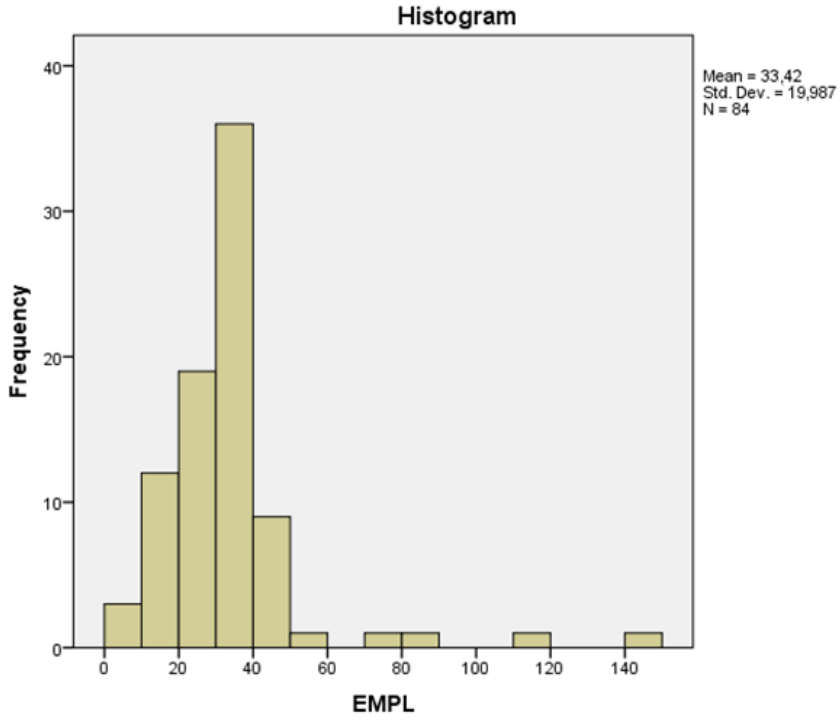

Figure 19: The size of Chilean companies

The respondents were balanced according to their sex (See Figure 20), though the average age of those was skewed to the older group of people: the mean value for the age equals 42 years (See Figure 21).

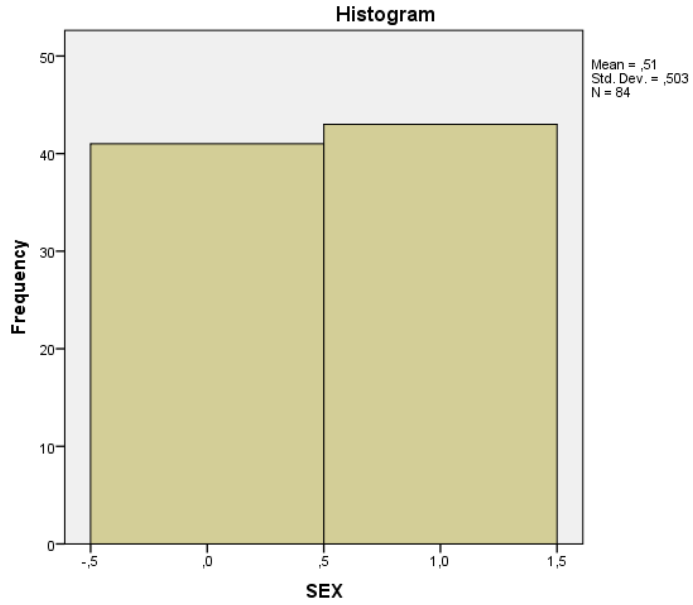

Figure 20: The sex of the Chilean companies' representatives

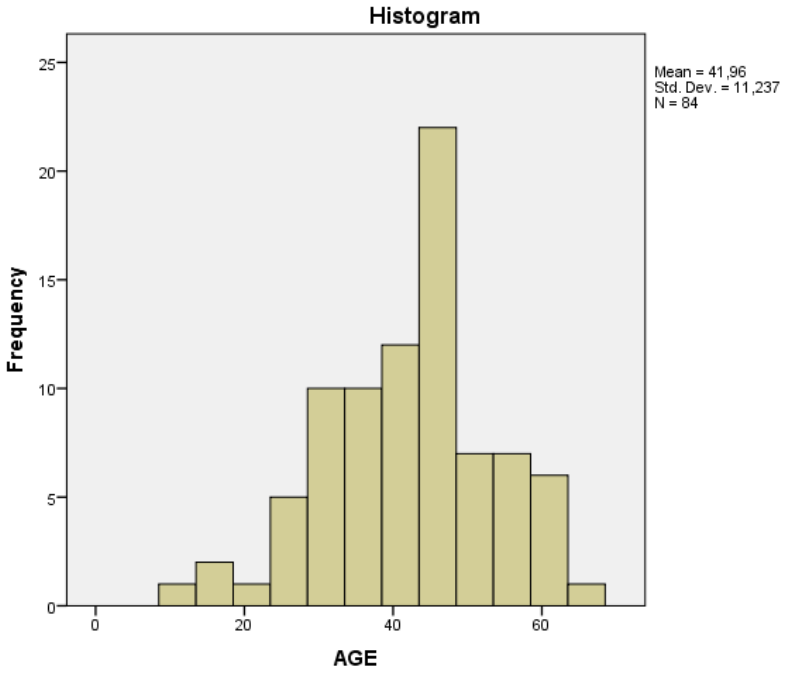

Figure 21: The age of the Chilean companies' representatives

It is also important to see the percentage of the companies that state that they engage into the innovative activities (See the Figure 22).

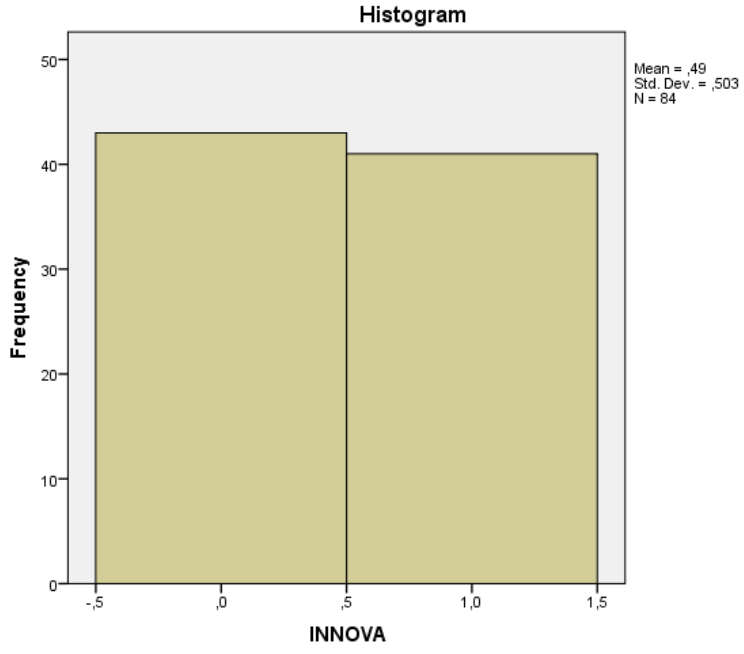

Figure 22: The distribution of the Chilean companies' decisions to innovate

Let us as well take a look at the distribution of thwe innovation sourcing modes for Chile (See the Figure 23).

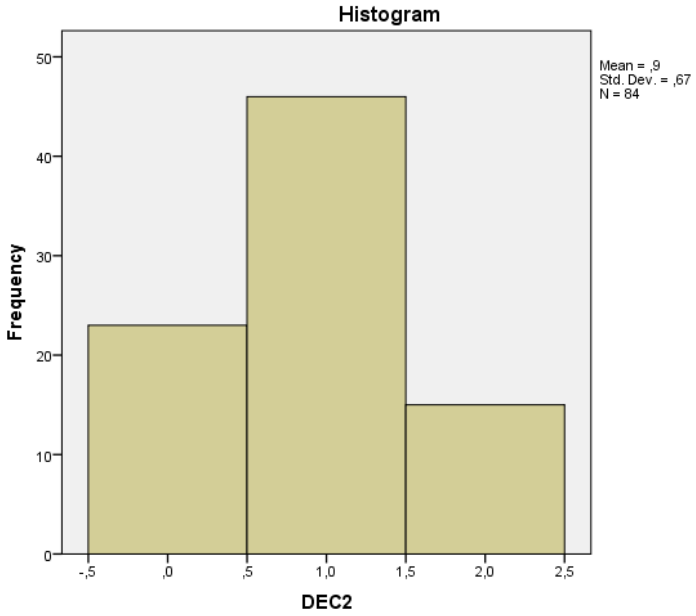

Figure 23: The distribution of the Chilean companies' decisions on the innovation sourcing

Variable	Number of observations	Mean	Standard deviation	Minimum value	Maximum value
INNOVA	84	,49	,503	0	1
MAKE	84	,06	,238	0	1
BUY	84	,87	,339	0	1
PRTN	84	,07	,259	0	1
INST	84	7,99	1,387	5	10
INFR	84	6,26	2,570	0	10
HUMC	84	3,89	1,676	0	10
MARK	84	7,69	1,013	5	10
BUSN	84	4,15	2,476	1	10
CREO	84	6,43	2,991	1	10
TRNF	84	4,54	1,312	0	7

Table 4: Descriptive statistics for the variables, Chile

2.3.2 Descriptive statistics: Russia

As for the distribution of Russian companies' sizes, the mean value is slightly higher than the one in Chile and equals 102 employees (See Figure 24)

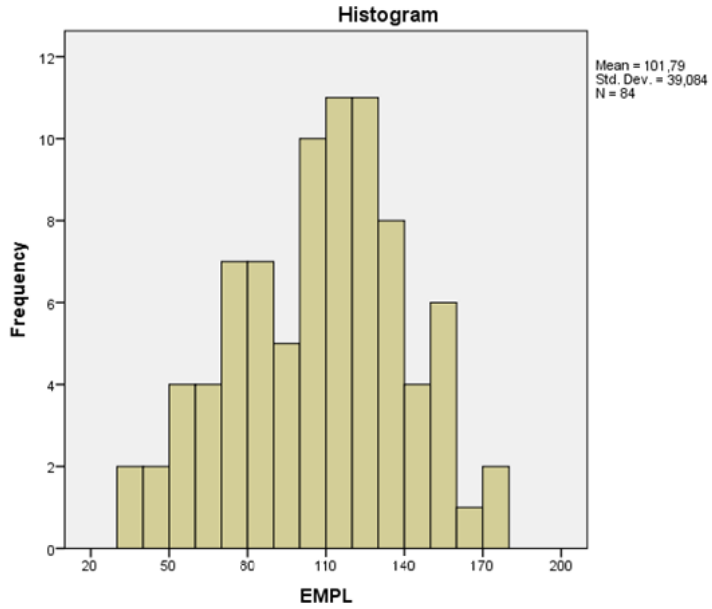

Figure 24: The size of Russian companies

The respondents were balanced according to the sex (See Figure 25), but the average value of the age was lower than the one for Chile: the mean equals 36 years (See Figure 26).

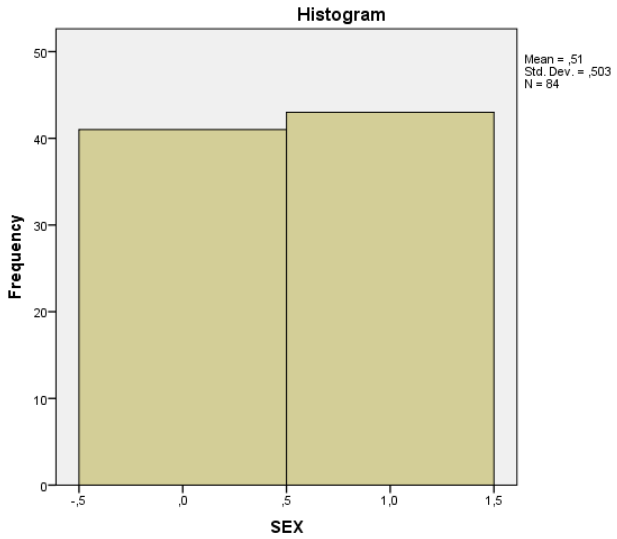

Figure 25: The sex of the Russian companies' representatives

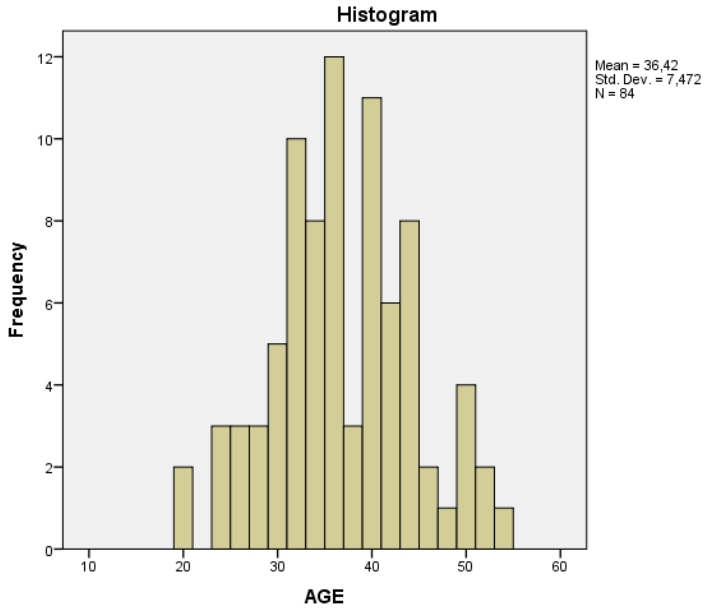

Figure 26: The age of the Russian companies' representatives

Let us show the percentage of the Russian companies that state that they engage into the innovative activities (See the Figure 27).

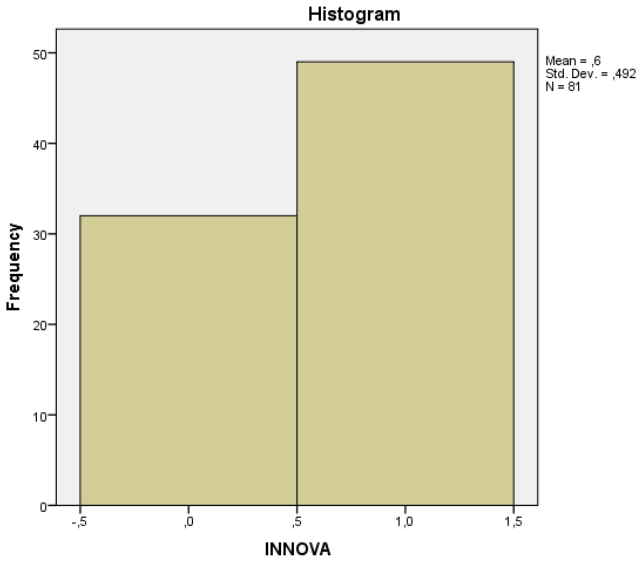

Figure 27: The distribution of the Russian companies' decisions to innovate

Let us as well take a look at the distribution of thwe innovation sourcing modes for Russia (See the Figure 28).

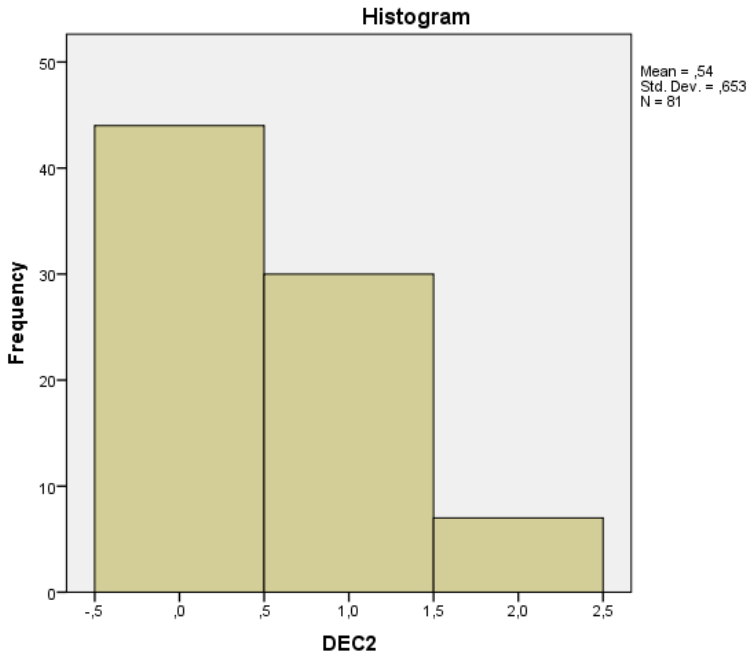

Figure 28: The distribution of the Chilean companies' decisions on the innovation sourcing

Variable	Number of observations	Mean	Standard deviation	Minimum value	Maximum value
INNOVA	81	,60	,492	0	1
MAKE	81	,54	,501	0	1
BUY	81	,37	,486	0	1
PRTN	81	,09	,283	0	1
INST	81	4,62	1,157	3	8
INFR	81	5,58	2,514	0	10
HUMC	81	6,42	3,553	1	10
MARK	81	4,81	3,047	1	10
BUSN	81	6,51	2,276	1	10
CREO	81	4,48	2,192	0	8
TRNF	81	6,31	3,360	1	10

Table 5: Descriptive statistics for the variables, Russia

3. Results

This chapter comprises the results of building the two regression models.

When the necessary number of responses was collected, I created two separate regression models in IBM SPSS (v. 22) – one logit model for the determinants of the decision to innovate, and one probit model for the determinants of the choice of the innovation sourcing mode.

3.1 The results for the decision to innovate

3.1.1 Logistic regression output for Chile

Following the existing approach to assess the factors of the innovation ecosystem in a country, the following explanatory variables are included: institutions, infrastructure, human capital sophistication, market sophistication, business sophistication, creative outputs and knowledge, and technology transfer.

The summary statistics for the logit model are presented in the Table STAT, where the high Chi-squared of the model indicates the high joint explanatory power of the independent variables (chi2=58.391, p=0.000).

Logistic regression		Number of Observations=	81
		LR chi2(7) =	58,391
		Prob>chi2 =	0.000
Log likelihood = 58,010		Pseudo R2 =	0.501
	Coefficient	**Std. Err.**	**P>|z|**
INST	1,823***	0,504	0,000
INFR	0,134	0,140	0,337
HUMC	-0,020	0,212	0,925
MARK	0,063	0,349	0,857
BUSN	-0,119	0,247	0,630
CREO	-1,123***	0,333	0,001
TRNF	0,421	0,313	0,178

Table 6: Logistic regression output, Chile

The coefficients in the Table 6 represent the estimated partial derivatives of probabilities considering the vector of the characteristics. Thus, the coefficients of the logistic regression models show how much the probability that the company engages in the innovation activities with an increase in the independent variable, given the other independent variables remain constant.

Only two coefficients out of the seven included are significant: institutions and creative outputs (1% level of significance). The highly significant coefficient of the institutions development shows that, all else equal, a Chilean firm that assesses the ease of paying taxes or/and the ease of getting credits as high, has 18% higher probability of being an innovative

company. Same, all else equal, if a company assesses the ability of other representatives of the industry (either local or foreign) to create new business models as high, it has 11,2% lower probability to engage into R&D activities. Whereas, other variables, have the expected sign, but do not show up significant when it comes to the decision to either innovate or not.

3.1.2 Logistic regression output for Russia

Let us take a look at the results for the decision to innovate for the Russian firms (See Table 7). The high Chi-squared of the model again indicates the high joint explanatory power of the independent factors (chi2=52.458, p=0.000).

Logistic regression		Number of Observations=	84
		LR chi2(7) =	52,458
		Prob>chi2 =	0.000
Log likelihood = 57,310		Pseudo R2 =	0.568
	Coefficient	**Std. Err.**	**P>|z|**
INST	1,823	0,307	0,234
INFR	-1,755	0,158	0,337
HUMC	0,801**	0,173	0,025
MARK	-1,509	0,399	0,528
BUSN	1,843**	0,187	0,031
CREO	0,089	0,193	0,711
TRNF	1,574*	0,290	0,082

Table 7: Logistic regression output, Russia

Three coefficients out of the seven included resulted significant: human capital sophistication, business sophistication and technology transfer. The first two of them are significant on the 5% level, the latter – on the 10% level of significance. Thus, all else equal, a Russian firm that assesses the human capital available as a very good has 8% higher probability to engage into the innovative activities. Furthermore, a Russian firm that assesses the businesses in the industry as sophisticated, has 18,4% higher probability to innovate. Lastly, a Russian firm that assesses the technology transfer as high has 15% more probability to be innovative. Whereas, all the other variables, have the expected sign, but do not show up significant when it comes to the decision to either innovate or not.

In the next let me present the results of the analysis on how the firms decide on their innovation strategy.

3.2 The results for the decision on innovation sourcing mode

3.2.1 Multinomial logistic regression output for Chile

In the Table XX the traditional table with the results is presented, where the "MAKE" strategy is taken as a reference category for the multinomial regression model. Notice that the log-likelihood (132.364) and the Pseudo R^2 (0.793) remain the same for all the three models for Chile. The multinomial Logit model estimates k-1 models, where k is the number of levels of the outcome variable, which in this case equals 2 (3-1).

To figure out what strategy is preferable by the Chilean companies, let me summarize the results obtained in the Tables 8 and 9. In the Table 8 only one factor is significant: bureaucratic issues, having a negative coefficient and meaning that the "PARTNER" strategy is 16% less preferred than the "MAKE" strategy by the firm that assesses the bureaucracy as more favorable.

	BUY		**PARTNER**	
Variables	**Coefficient**	**Std. Err.**	**Coefficient**	**Std. Err.**
INST	1,979 (0,992)	7,008	-1,571*** (0,010)	0,608
INFR	1,822 (0,851)	4,969	-0,260 (0,178)	0,193
HUMC	-1,167 (0,995)	6,034	0,463 (0,222)	0,379
MARK	3,165 (0,469)	6,020	0,315 (0,527)	0,499
BUSN	-3,436 (0,597)	3,089	0,085 (0,820)	0,372
CREO	11,800 (0,965)	6,804	0,061 (0,883)	0,414
TRNF	0,980 (0,265)	7,074	0,119 (0,749)	0,373
Number of Observations = 84 Log likelihood = 34,304 LR chi2(7) = 132,364 Prob>chi^2 = 0.000 Pseudo R^2 = 0.793 **P<1, **P<0.05, and*** P<0.01; Sig. in brackets*				

Table 8: Multinomial logit - MAKE as a reference, Chile

If taking the "BUY" strategy as a reference (See Table 9), it can be withdrawn that the "BUY" strategy is 24% more preferred by companies than the "PARTNER" strategy in case of a good institutions development. Moreover, the "BUY" strategy is 19% more preferred by companies that assess the market sophistication as high, compared to the "MAKE" strategy.

	MAKE		**PARTNER**	
Variables	**Coefficient**	**Std. Err.**	**Coefficient**	**Std. Err.**
INST	-,874 (0,992)	5,429	-2,445*** (0,010)	5,429
INFR	-1,027 (0,851)	2,963	-1,288 (0,561)	4,963
HUMC	0,890 (0,995)	4,896	1,353 (0,997)	4,896
MARK	-1,977*** (0,000)	0,499	-1,662 (0,241)	0,000
BUSN	2,417 (0,597)	3,677	2,502 (0,995)	3,677
CREO	-7,676 (0,965)	4,182	-7,616 (0,197)	2,183
TRNF	-0,673 (0,265)	1,045	-,554 (0,575)	4,429
Number of Observations = 84 Log likelihood = 34,304 LR chi2(7) = 132,364 Prob>chi2 = 0.000 Pseudo R2 = 0.793 **P<1, **P<0.05, and*** P<0.01; Sig. in brackets*				

Table 9: Multinomial logit - BUY as a reference, Chile

The further discussion of the approval or disapproval of the hypotheses stated in the first chapter will be held in the Chapter 4 – Discussion and conclusions.

3.2.2 Multinomial logistic regression output for Russia

Now let me discuss the results of the multinomial logit model for Russian companies. Likewise, the two models will be presented: one with the "MAKE" strategy as a reference and one with the "BUY" strategy as a referral. Again, the log-likelihood (142.464) and the Pseudo R2 (0.828) remain the same for all the three models for Russia. In the Table 10 there are two

factors that are significant on the 10% level: human capital sophistication and the technology transfer quality. Thus, for a firm that assesses the human capital in the country as sophisticated, it would rather choose a "MAKE" strategy over the "PARTNER" one (6% more probably). Moreover, if the knowledge and technology transfer is assessed as high, the company will 6% more probably choose the "PARTNER" strategy than the "MAKE" strategy.

	BUY		**PARTNER**	
Variables	**Coefficient**	**Std. Err.**	**Coefficient**	**Std. Err.**
INST	-65,556 (0,988)	2,286	-0,174 (0,651)	0,384
INFR	-53,962 (0,416)	3,429	-0,167 (0,337)	0,174
HUMC	552,918 (0,218)	0,000	-0,596* (0,051)	0,415
MARK	412,081 (0,441)	4,968	-0,190 (0,643)	0,409
BUSN	-173,920 (0,505)	3,642	0,140 (0,516)	0,216
CREO	-53,223 (0,812)	7,969	-0,191 (0,346)	0,203
TRNF	-813,368 (0,717)	4,348	0,618* (0,093)	0,400
Number of Observations = 81 Log likelihood = 35,511 LR chi2(7) = 142,464 Prob>chi2 = 0.000 Pseudo R2 = 0.828 **P<1, **P<0.05, and*** P<0.01; Sig. in brackets*				

Table 10: Multinomial logit - MAKE as a reference, Russia

In the Table 11 the model with the "BUY" strategy as a reference is presented. There we can see that in case companies assess the infrastructure access as very good, it would be less likely to choose the "BUY" strategy in comparison to both "MAKE" (13%) and "PARTNER" (12%) strategies. Then, a firm that assesses the human capital in Russia as well-developed has 13% more probability to choose the "MAKE" strategy over the "BUY" one. Interestingly the "PARTNER" strategy is 15% more preferred than "BUY" by the Russian companies in case of

high market sophistication. Moreover, the "MAKE" strategy is chosen by the Russian companies 26% more in case of high business sophistication and 5% more in the innovation ecosystem with a well-developed technology transfer system.

	MAKE		**PARTNER**	
Variables	**Coefficient**	**Std. Err.**	**Coefficient**	**Std. Err.**
INST	2,406 (0,349)	0,785	20,231 (0,353)	0,788
INFR	1,384* (0,059)	0,683	1,217* (0,062)	0,684
HUMC	1,295*** (0,001)	0,378	1,890 (0,531)	1,378
MARK	-1,345 (0,121)	0,445	1,535*** (0,000)	1,447
BUSN	2,607*** (0,002)	0,378	0,747 (0,132)	1,379
CREO	1,509 (0,806)	3,043	1,319 (0,808)	3,043
TRNF	0,556*** (0,000)	0,400	0,174 (0,298)	0,405
Number of Observations = 81 Log likelihood = 35,511 LR chi2(7) = 142,464 Prob>chi2 = 0.000 Pseudo R2 = 0.828 **P<1, **P<0.05, and*** P<0.01; Sig. in brackets*				

Table 11: Multinomial logit - BUY as a reference, Russia

Let me gather at one place the two questions discussed in the study and present all the hypotheses with the corresponding results. I will use three abbreviations to distinguish between the three possible outputs: PC for "Proven correctly", PR for "Proven reversly", meaning the opposite sign of the resulting coefficient, and NP for "Not proven" in case of obtaining statistically insignificant coefficients (See Table 12).

Hyp. #	Determinants	Decision to innovate		Decision to source innovation	
1	Institutions development	+	P(C)	MAKE	P(C)
2	Infrastructure	+	NP	MAKE	P(R)
3	Human capital and R&D	-	P(R)	PARTNER	P(R)
4	Market sophistication	+	NP	MAKE	P(R)
5	Business sophistication	+	P(R)	MAKE	P(R)
6	Creative output	-	P(C)	BUY	NP
7	Knowledge & technology transfer	+	P(R)	MAKE	PR(R)

Table 12. Summary of all the hypotheses results of the study

3.3 Comparison of the results for Chile and Russia

Now let me gather all the coefficients of both logistic regressions at one place (See Table 13), the level of the coefficients' significance is indicated in the asterisks. For further discussion, I have outlined the cells where the hypothesis has been proven by using the green color and where it is neither proven nor disproven – by using the red color.

Independent variables	**Hypotheses**	**Chile**	**Russia**
INST	+	1,823***	1,823
INFR	+	0,134	-1,755
HUMC	+	-0,020	0,801**
MARK	-	0,063	-1,509
BUSN	+	-0,119	1,843**
CREO	-	-1,123***	0,089
TRNF	+	0,421	1,574*

* the coefficients are significant at the 0.1 level

** the coefficients are significant at the .05 level

*** the coefficients are significant at the .01 level

grey cell - initial hypothesis has been proved

red cell - initial hypothesis has not been proved

Table 13. Summary of coefficients for both logistic regression models

Let me discuss the results of each of the hypotheses separately.

The first hypothesis regarding the institutions development has been proven for Chile, where the respondents overall assesses this parameter as high. Thus, in case of Chile the investigation has proven the positive correlation of favorable bureaucratic environment and the decision to innovate by companies. Moreover, the "PARTNER" strategy in terms of sourcing innovations is significantly less preferable than both "BUY" (24%) and "MAKE" (16%) strategies. This means that the companies that assess the bureaucratic issues as favorable feel no need to collaborate with other companies to overcome legal and financial barriers. In addition, the better the institutions are developed, the higher the desire of Chilean companies to engage in R&D is. Thus, the hypothesis stating that "A firm that assesses the bureaucratic environment as favorable will be more inclined to choose the "MAKE" strategy" is partly proven in that study.

As for Russia, the dependency of the decision to innovate on the institutional factors has not been proven, and the choice of the innovation sourcing strategy in not clearly dependent of that neither. Though, taking a look at the distribution of the responses on institutions for both countries (see Figure 29), it is clear that it is skewed to the right for Chile and more to the left for Russia (means 7.99 and 4.71 respectfully). Thus, coming back to the hypothesis saying that there is no difference between institutions development in Russia and Chile, it is rejected for that study (See Table 14).

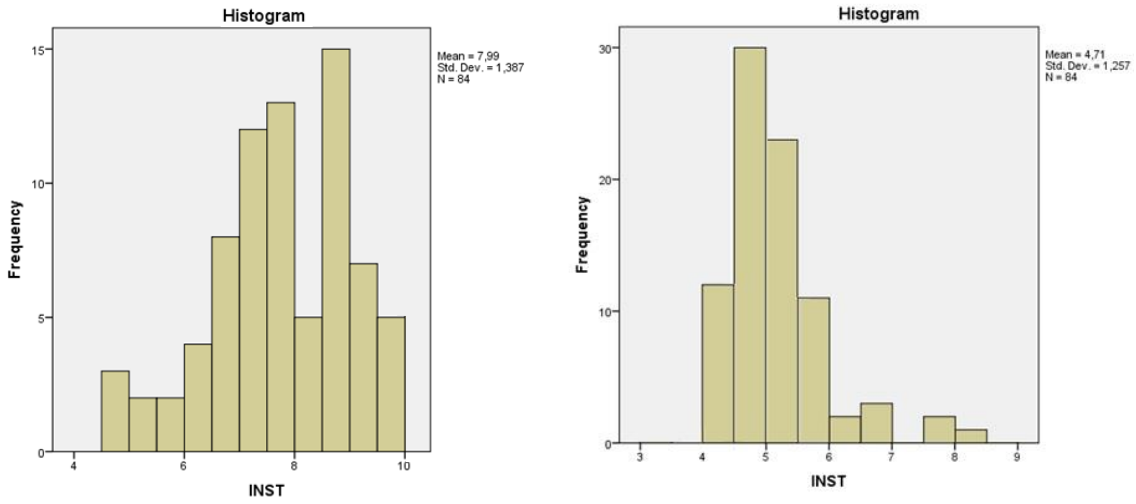

Figure 29: The distribution of the responses on bureaucratic issues for Chile (on the left) and Russia (on the right)

The second hypothesis regarding the infrastructure development has not been proven both for Chile and Russia; moreover, the results for Russia display the negative coefficient,

which is against the initially stated hypothesis. The effect of that variable on companies' decision to innovate remains unclear after the research. However, as for the decision on the innovation source, in case of Russia companies that assess the infrastructure access as very good, it are less likely to choose the "BUY" strategy in comparison to both "MAKE" (13%) and "PARTNER" (12%) strategies. This result can mean that Russian SMEs are more likely to either invest in technologies and innovations in-house or cooperate with other businesses in case of good infrastructure development and ICT access in the country. Thus, the hypothesis stating that "A firm assesses the infrastructure access as very good will be more inclined to choose the "MAKE" strategy" has been proven in the study.

Taking a look at the comparison of the distribution of the responses on infrastructure for both countries (see Figure 30), it is clear the one for Chile is more skewed to the right (means 6.26 and 5.58 for Chile and Russia respectfully). Thus, overall company representatives from Chile assess the infrastructure as better than those in Russia, which leads to desire to foster innovations on a company level and invest in R&D. Thus, coming back to the hypothesis 2 saying that there is no difference between infrastructure development in Russia and Chile, it cannot be rejected for that study (See Table 14).

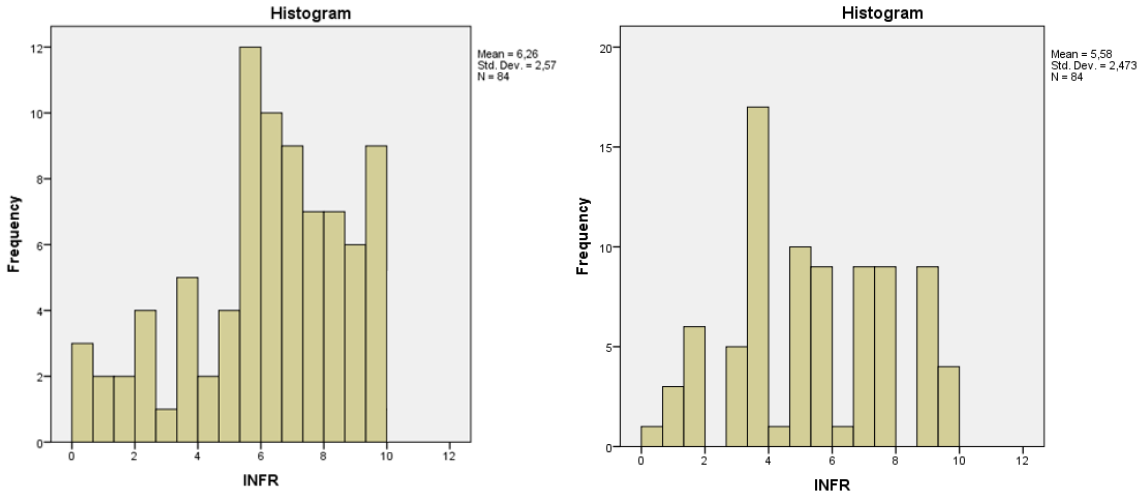

Figure 30: The distribution of the responses on infrastructure for Chile (on the left) and Russia (on the right)

The third hypothesis regarding the human capital sophistication has been proven for the Russian market, and states that it positively affects the decision of Russian companies to engage into R&D activities. However, in terms of the effects on the choice of the innovation sourcing mode, there have not been proved any effects for Chile. But as for Russia, there are statistically significant results, showing that Russian firms that assesses the human capital in the country as sophisticated would rather choose a "MAKE" strategy over both – the "BUY" one (13%) and

"PARTNER" one (6% more probably). Thus, possessing a highly qualified labor force, Russian companies decide to engage into innovation activities, create technologies and innovative solutions in-house rather than buying them or partnering for them. The hypothesis stating that "the firms that assess the human capital as sophisticated will be more inclined to choose the "MAKE" strategy" is proved in that study.

If taking a look at the distribution of the responses on human capital for two countries, the one for Chile is more skewed to the left and the mean values are 3.89 and 6.26 for Chile and Russia respectfully (See Figure 31). Thus, coming back to the hypothesis 3 saying that there is no difference between the human capital sophistication in Russia and Chile, it is rejected for that study (See Table 14).

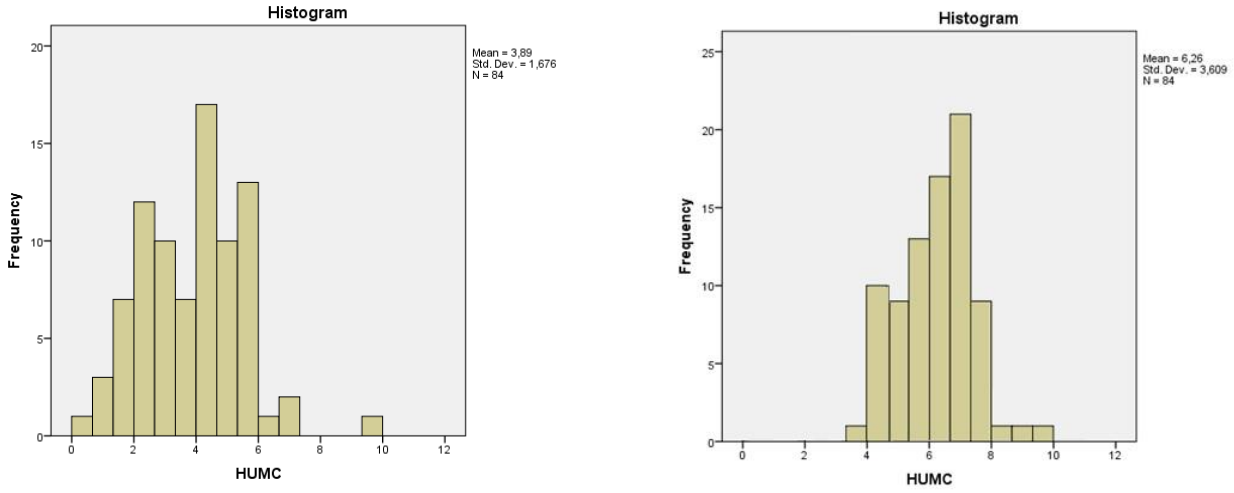

Figure 31: The distribution of the responses on human capital for Chile (on the left) and Russia (on the right)

The forth hypothesis regarding the market sophistication has not been proven neither for Chile nor for Russia, thougth in case of Chile a slightly positive coefficient has been obtained, which contradicts the primarily stated assumption. Thus, the effect of the market openness and the intensity of local compatition remains unclear for that study. However, some statistically significant results have been achieved in regards to the innovation sourcing modes in both countries. As for Chile, the "BUY" strategy is 19% more preferred by companies that assess the market sophistication as high, compared to the "MAKE" strategy. But in Russia the companies interestingly preferred the "PARTNER" strategy is 15% more compared to the "BUY" stretegy in case of high market sophistication. Thus, the hypothesis that stated "A firm that assesses the market sophistication as high will be more inclined to choose the "PARTNER" strategy" is proven for Russian companies in that study.

As shown on the Figure 32, the responses for Chile are more skewed to the right, while in Russia, on the contrary, to the left with the mean values of 7.69 and 3.83 respectfully. Thus, companies in Chile, assessing the market sophistication in the country as high, preferred to simply purchase innovations and technologies in conditions of high competition in the industry. While Russian companies were assessing the market as closed, with the common situation of monopolies and exclusive rights on know-hows in the country, they preferred rather to group with other companies and collaborate altogether in order to perferm costly R&D activities. Thus, coming back to the hypothesis 4 saying that there is no difference between the market sophistication in Russia and Chile, it is rejected for that study (See Table 14).

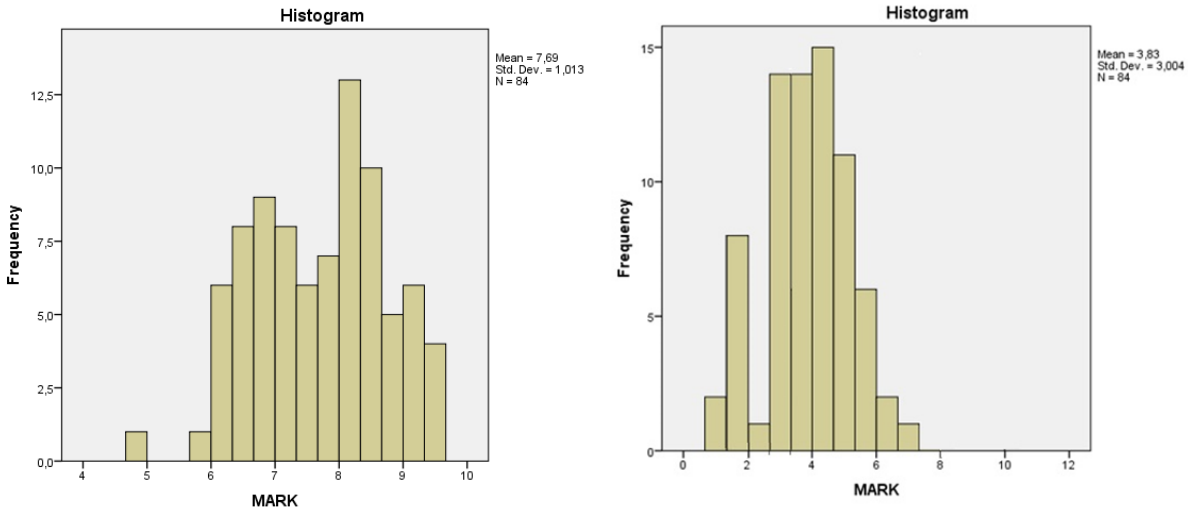

Figure 32: The distribution of the responses on market sophistication for Chile (on the left) and Russia (on the right)

The fifth hypothesis regarding the business sophistication has been proven for the Russian companies' sample: there is a positive correlation between the availability of knowledge intensive labor force and the innovativeness of Russian companies. The sign of the coefficient is positive as expected, and the availability of the sophisticated experienced professionals makes it easier for Russian companies to become innovative. In terms of the choice of the innovation sourcing strategy, there is no statistically significant dependency obtained in case of Chile, but for Russia – yes. The "MAKE" strategy is chosen by the Russian companies 26% more probable in case of high business sophistication, which proves once more the previously explained choice to innovate in-house. Thus, the hypothesis "A firm that assesses the business in the industry as sophisticated will be more inclined to choose the "MAKE" strategy" is proven in the current study.

If taking a look at the distribution of the responses on business sophistication for both countries (See Figure 33), it is seen that the distribution is a bit skewed to the left in case of Chile and a bit to the right in case of Russia (means of 4.15 and 6.37 respectively). Thus, Russian companies, assessing the overall readiness of the knowledge intense employees to be hired and engaged into R&D activities as high, are more likely to become innovative and invest in R&D without any external collaboration. Thus, coming back to the hypothesis 5 saying that there is no difference between the business sophistication in Russia and Chile, it cannot rejected for that study (See Table 14).

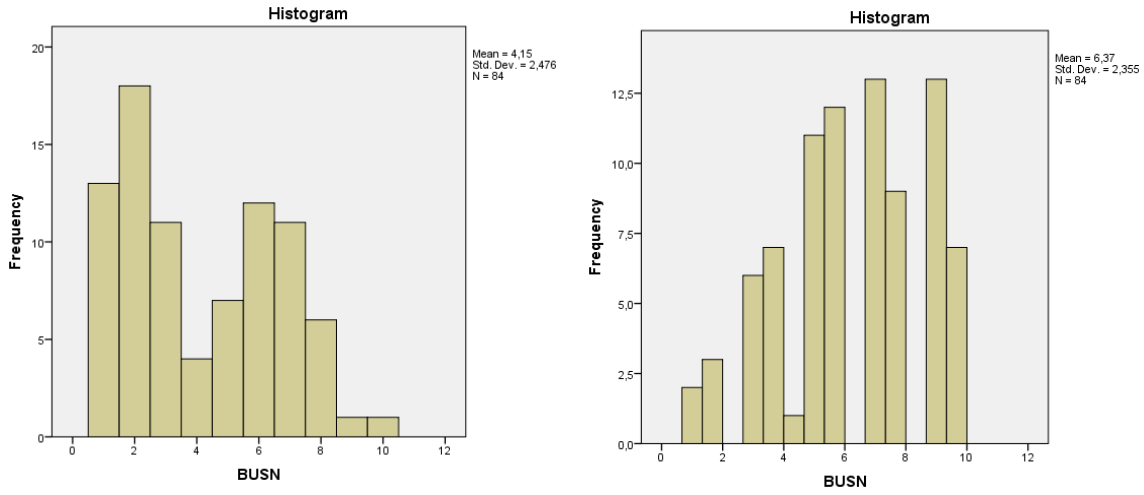

Figure 33: The distribution of the responses on business sophistication for Chile (on the left) and Russia (on the right)

The sixth hypothesis regarding the creative outputs in the country has been proven for Chile: the ability of local companies to create new business models affects negatively the desire of other companies to engage into the R&D ativities. Although there have not been obtained any significant results in terms of the dicision to source innovations both in case of Chile and in case of Russia. The distribution of the responses on creative outputs for both countries is presented in the Figure 34 has not been very informative, though showing the mean level for Chile a bit higher than the one for Russia (6.43 and 3.39 respectiviely). Thus, coming back to the hypothesis 6 saying that there is no difference between the creatiive outputs in Russia and Chile, it cannot be rejected for that study (See Table 14).

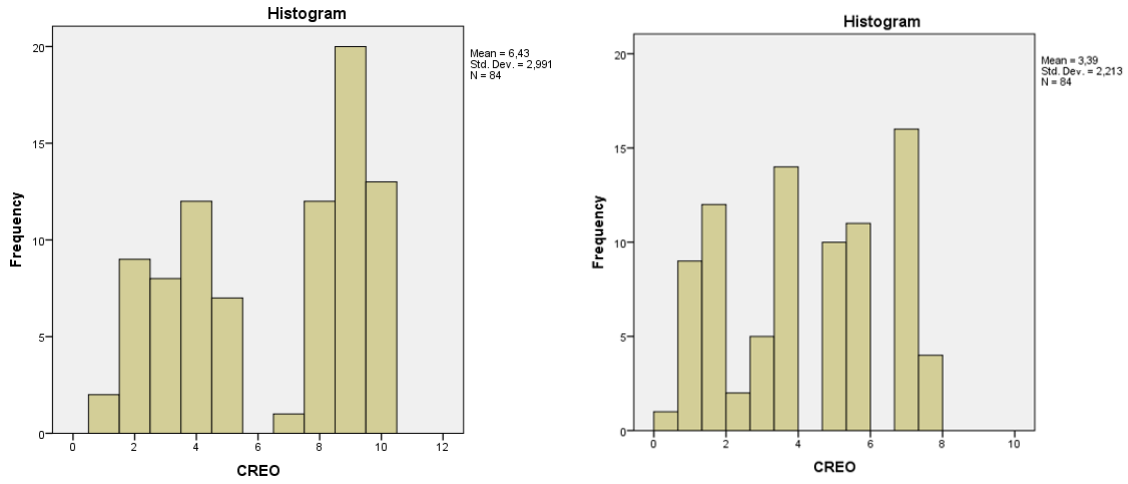

Figure 34: The distribution of the responses on creative outputs for Chile (on the left) and Russia (on the right)

The seventh hypothesis regarding the knowledge and technology transfer has been proven for the Russian sample – there is a positive correlation between the development of the technology transfer structures in a country and the decision of SMEs to engage into innovative activities. Moreover, in case of Russia in the innovation ecosystem with a well-developed technology transfer system, the company will 6% more probably choose the "PARTNER" strategy than the "MAKE" strategy, and the "MAKE" strategy 5% more over the "BUY" stretegy. In other words, the strategy of purchasing the innovations is the least preffered strategy for Russian companies. Thus, the hypothesis regarding the innovation sourcing mode, stating that "A firm that assesses the technology transfer as high will be more inclined to choose the "MAKE" strategy" is disproven in that study.

Moreover, the hypothesis regarding the cross-country comparison saying that "There is a significant difference between knowledge & technology outputs in Russia and Chile, Russia much better than Chile, can be partly proven by this investigation. Let us take a look at the distribution of the responses on technology transfer for both Chile and Russia (See Figure 35) and notice that the one for Russia is more skewed to the right (mean values of 4.54 and 6.22 for Chile and Russia respectfully). Thus, coming back to the hypothesis 7 saying that there is no difference between the technology transfer in Russia and Chile, it is rejected for that study (See Table 14).

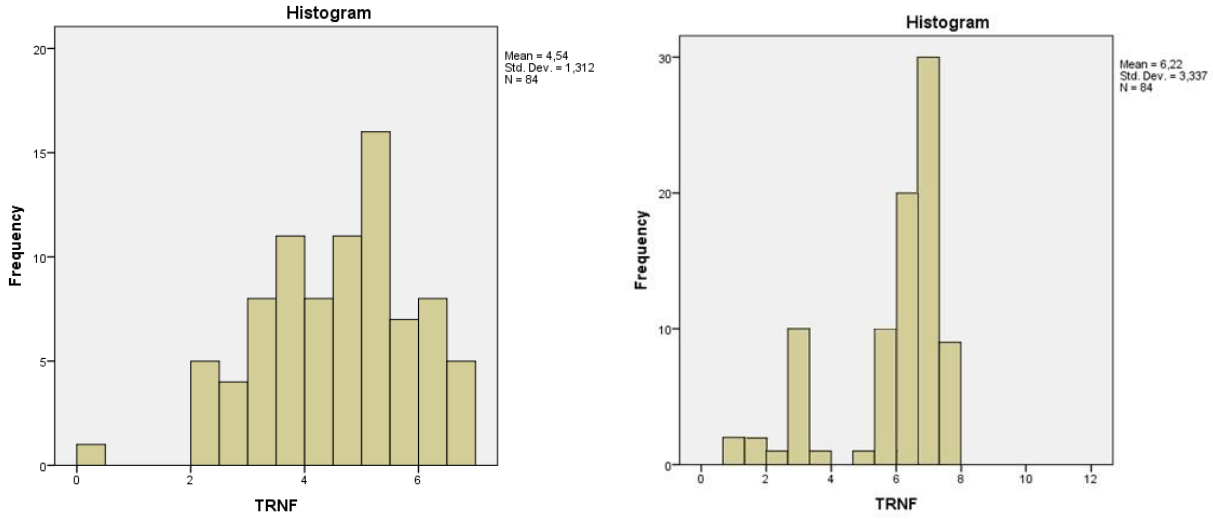

Figure 35: The distribution of the responses on technology transfer for Chile (on the left) and Russia (on the right)

Coming down to the statistical testing of the hypotheses regarding the significant difference between the countries' performance on each of the parameters, the t-test results are demonstrated on the Table 14, showing that there is a significant difference between Chile and Russia in the areas of (1) human capital sophistication, (2) bureaucratic issues and (3) technology transfer (H_0 rejected).

Independent variables	**t**	**t-crit**	**df**	**p**	**Decision**
INST	2.73	1.98	106	**0.039**	**Reject**
INFR	1.11	1.98	106	0.718	Accept
HUMC	2.81	1.98	106	**0.015**	**Reject**
MARK	1.68	1.98	106	0.136	Accept
BUSN	1.89	1.98	106	0.259	Accept
CREO	1.57	1.98	106	0.421	Accept
TRNF	2.15	1.98	106	**0.098**	**Reject**

Table 14: The results of the t-test for the countries' comparison

Thus, even though the differences in the means for Chile and Russia were quite big, statistically it was proven only for the three factors on the level of significance equal to 10%.

4. Conclusion

The companies' willingness to engage into some innovative activities, as well as their success depends highly on the level of innovation system development of a country, while the majority of studies aim either to find out some internal company-specific drivers for that or to conduct a country-level comparison of innovation performance. This is why this research aims to investigate the influence of the institutional contexts on taking decisions about innovativeness on the firm level. Starting with the overview of the approaches to structure and systematically analyze the innovation ecosystem of a country, I came up with the "Innovation Policy Terrain" approach discussing the three categories of external factors influencing companies' innovativeness: the framework conditions, science and engineering base, and transfer factors. Thus, after conducting a theoretical literature analysis, the seven variables for the further research have been outlined, according to the classification of drivers utilized in the Global Innovation Index rating. Moreover, two main groups of hypotheses were stated: firstly, concerning the influence of those drivers on the decision of companies either to engage into innovative activities or no; and, secondly, concerning their influence on the choice of the innovation sourcing mode. Further comparison of the results for two countries – Chile and Russia, was conducted to provide specific recommendations for the companies on those markets.

By sending out a questionnaire to both Chilean and Russian companies, I have gathered two samples of 84 and 81 firms respectfully, which self-selected them for that study. This have assured that the question of innovations and R&D was somehow relevant to the respondents, so they were more attentive while answering questions and representative for the research. Thus, 45% of Chilean companies and 40% of Russian companies indicated they were not engaging in any R&D, and the most preferable way to source innovations were the "BUY" strategy for the Chilean companies and the "MAKE" strategy for the Russian companies. For testing the hypotheses for the determinants of the innovation strategies for the firms, two regression models were run: a logistic regression for the decision to innovate and a multinomial logistic regression for the choice of the innovations' source.

As for the decision to innovate, the statistically significant drivers of it resulted to be different for Chile and Russia – in Chile has been proven the positive influence of the institutions development and the negative influence of the ability of local competitors to commercialize the creative outputs. While in Russia, the positive correlation with the human capital sophistication, business sophistication and strength of the technology transfer in a country has been demonstrated. Moreover, when it came to the decision on the choice of the innovation sourcing mode, Russian companies preferred the "MAKE" strategy in case of high infrastructure

development, market and business sophistication and the “PARTNER” strategy in case of sophisticated human capital available and strong knowledge and technology transfer. As for Chilean companies, they preferred the “MAKE” strategy when assessing the institutional environment as well-developed and no other significant evidence has been obtained.

Theoretical and managerial implications are obtained from this study. Firstly, the study proposes the determinants of the innovation strategy choice on the firm level, which is an area that is barely covered in the academic literature. Secondly, taking into consideration the scarcity of previous studies, the results of that study can be used for further cross-cultural comparison of innovation ecosystems and their influence on firms’ decisions. Managers, when taking decisions about technologies adoption on either Russian or Chilean market, can use the drivers of the choices on the innovation sourcing modes. The comparison of these two emerging markets is interesting because, even though being placed on the 43rd and the 44th places on the Global Innovation Ranking, the countries reach this result driven by absolutely different factors. Thus, Chile is characterized by better developed institutions and infrastructure, as well as high market openness, and the companies tend to rather purchase innovations and technologies. As for Russia, the human resources base along with a large number of knowledge intensive employees are comparatively higher assessed, so the companies prefer on average more often to invest into R&D in-house. These factors have to be taken into account by managers while taking decisions on innovations, as the industries and company characteristics may differ, but the influence of the innovation ecosystem indicators can be somehow predictable if using the model developed in this master thesis.

The study has several limitations: firstly, a larger sample size would allow decreasing the firms’ specific effects on the results. Secondly, the aspect of the innovation activities’ complementarity is not reflected in the current study, so a detailed econometric approach would solve this issue. Thirdly, it will be useful to include into the research some industry-specific factors, as they may add the explanatory power of the model. Finally, the comparison with other either developing or developed countries would add some more specific characteristics of the Russian innovation ecosystem voids. This would allow getting a more complex understanding on the decision-making process of real companies operating on a certain market.

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6. Appendices

Appendix 1.

Questionnaire design

1. Please, indicate the name of the company you are working for.
2. How many employees does your company have?
3. Please, indicate your sex.
4. Please, indicate your age.
5. Does your company engage into the innovative activities? Yes/No
6. How does your company deal with the new technologies and innovative solutions? Makes in-house / Purchases / Partners with other companies in order to get them

Now, please, assess, how each of the factors of the innovation ecosystem in your country affects the innovativeness of your company?

Institutions

7. Assess the ease of paying taxes in for your company (-5) Very difficult (5) Very easy
8. Assess the ease of getting a credit for a company like yours? (-5) Very difficult (5) Very easy

Infrastructure access

9. Assess the ability of companies of your industry to access ICT in your country? (-5) very bad (5) very good

Market sophistication

10. Assess the intensity of local competition for your industry (-5) not intense at all (5) very intense.
11. Assess the market openness in terms of innovations for your country (-5) very close (5) very open

Human capital sophistication

12. Assess the availability and sufficiency of well-prepared graduates in science in your country (-5) very bad (5) very good

Business sophistication

13. Assess the sufficiency of employees working for the knowledge intensive positions (-5) we lack them (5) there are too many

Creative outputs

14. Assess the ability of local companies in your industry to create new business models (-5) very bad (5) very good

Knowledge and technology transfer

15. Assess the strength of the technological cooperation in business for your country (-5) very weak … (5) very strong
16. Assess the strength of knowledge and technology transfer in your country (-5) very weak … (5) very strong

Appendix 2.

Correlation matrix for the independent variables

Variables	INST	INFR	HUMC	MARK	BUSN	CREO	TRNF
INST	1,000	,033	,156	-,115	-,117	,015	,051
INFR	,033	1,000	,002	,137	,114	,155	-,001
HUMC	,156	,002	1,000	-,155	,008	-,027	-,070
MARK	-,115	,137	-,155	1,000	,030	-,116	-,017
BUSN	-,117	,114	,008	,030	1,000	,129	-,035
CREO	,015	,155	-,027	-,116	,129	1,000	-,100
TRNF	,051	-,001	-,070	-,017	-,035	-,100	1,000